BITUMINOUS COAL FIELDS

OF

PENNSYLVANIA

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BITUMINOUS COAL FIELDS OF PENNSYLVANIA

INTRODUCTORY VOLUME
PART I

GENERAL INFORMATION ON COAL

By

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BITUMINOUS COAL FIELDS
OF
PENNSYLVANIA

Projected reports.

Vol. I. Introductory volume.

Part I. General information.

II. Detailed description of coal fields.[1]

III. Bituminous coal resources of Pennsylvania.[2]

IV. Coal analyses.[3]

II. Pittsburgh field: Allegheny, Washington, Greene, Fayette, and Westmoreland counties.

III. Beaver field: Beaver, Butler, Lawrence, and Mercer counties.

IV. Lower Allegheny field: Armstrong, Indiana, Clarion, Jefferson, and Elk counties.

V. Eastern field: Centre, Clearfield, Cambria and Somerset counties, and Broad Top district.

VI. Upper Allegheny field: Venango, Forest, McKean, Crawford, and Warren counties.

VII. Northeastern field: Cameron, Clinton, Potter, Bradford, Lycoming, Sullivan, and Wyoming counties.

VIII. Coal mining methods and costs. (Bituminous)

IX. Coal conservation and utilization.

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[1] Published in 1926. (Out of stock).
[2] Published in 1928.
[3] Published in January, 1925. Reprinted in 1928.

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Coal is King in Pennsylvania. Pennsylvania mines a billion dollars worth of coal a year. A single train carrying this annual output would reach more than twice around the world at the latitude of Pennsylvania. Coal forms nearly two-thirds of the freight of Pennsylvania, and is responsible for its four billion dollar iron and steel industry. Coal is the real reason why Pennsylvania, 32nd in size, is 2nd and not 10th to 15th in wealth, population, and industry.

Photograph by courtesy of Pennsylvania Railroad Company.

BITUMINOUS COAL FIELDS OF PENNSYLVANIA

PART I

GENERAL INFORMATION ON COAL

By Geo. H. Ashley

INTRODUCTION

Coal has played a major role in the advance of civilization and is one of the most valuable commodities known to man. It not only keeps him warm and cooks his food, but supplies him with light, with water, and oftentimes with air itself. It is a source of power; it is used in making almost every article in his house and in making the house itself. It transports him by train or boat; it prints his papers and books, and prepares the wires that carry his thoughts. Coal brings to man's door the products of the whole world. Its distillation adds nearly a thousand by-products, from the vaseline that soothes his pains to the tar that smooths the road he travels. With coal almost any feat is possible. Without it life would drop back into the laborious poverty of primitive times. Oil and gas may for a few years relieve in slight measure our need of coal. Water power, utilized through the use of coal, will permanently relieve some of the demand on our coal deposits, but today and for many centuries our use of coal will be the simplest measure of our material civilization.

Coal will not last forever. Already men are beginning to realize that the coal supplies of the world are not inexhaustible. In places the best has already been taken out of the ground, and coal is being mined today that fifty years ago was classed as unmineable. There is, therefore, a growing demand for information regarding the coal deposits of this and other States, not alone because of interest in their immediate development, but because of the widespread desire to know how long the deposits of any area will last. Formerly, information has mainly been sought concerning the thickness, quality and quantity of a particular bed. Today plans for super-power stations, adequate assessment for taxation, and other matters demand detailed information regarding all the beds of any district and under any tract of land.

The coal mined in Pennsylvania has four times the value of all

the rest of the mineral products of the State, a value that in 1920 and 1921 exceeded that of all metallic minerals mined in the United States, and is more than one-seventh of the value of all the mineral products of the United States. Of this the bituminous coal fields supplied (in 1918) 58 per cent and the anthracite fields 42 per cent. The total mineral production of the United States in 1920 was valued at $6,943,000,000, of Pennsylvania, at $1,314,332,558. The coal mined in Pennsylvania in 1920 was valued at $1,076,882,198, the bituminous coal of Pennsylvania at $642,630,000, nearly one-tenth of the value of all mineral products of the United States. In quantity Pennsylvania in 1923 produced nearly one-fifth of all the coal mined in the world, and 48 per cent of all mined in the United States.

Aside from the value of the coal as mined, the bituminous coal of Pennsylvania is, in large measure, responsible for the existence in this State of a vast industry in iron and other metals. The total metal and metal-products industry of Pennsylvania amounted in 1923 to nearly $4,000,000,000. Still further, it is probable that the coal industry of Pennsylvania may be credited in large measure with being responsible for several other industries in the State, including: the making of 160 million dollars worth of coke (in 1918), the use of 10 million dollars worth of limestone for flux, 24 million dollars worth of fire brick, not to mention moulding sand for foundries, graphite for crucibles, and other products for which market is found in the metal industry of the State. Indirectly the mining industry has played a large part in the silk and other industries in Pennsylvania through bringing into the State a large labor surplus in the families of miners. The bituminous coal fields of Pennsylvania therefore not only supply many people with heat necessary for comfort and cooking, but furnish the foundations of a large share of the industry of the State, are the source of most of its power, and furnish the largest single item of freight for its railroads.

Far-seeing people are beginning to ask themselves, What of the future? Pennsylvania has been supplying heat and power for a large part of the nation. For many decades it gave to the nation two-thirds of the nation's coal supplies. Today she is still filling 40 per cent or more of the nation's coal bins. Does she so far exceed the rest of the nation in her reserve of coal, or has she been draining her own resources, and is she likely to exhaust her supplies and thus lose her commanding position in the industrial world? That is one of the serious questions that led to the studies necessary for this report.

This is Part I of Volume I of a series of projected volumes on the coal fields of Pennsylvania. The volume as a whole is introductory to the rest of the volumes which are intended to deal in

detail with the coal deposits of the State. Because of the time likely to elapse before the succeeding volumes are prepared and printed it has been made much fuller than would have been necessary had all of the volumes been issued together.

This introductory volume consists of four parts:

Part I. General Information by Geo. H. Ashley.
II. Detailed Description of Coal Fields by James D. Sisler.
III. Coal Resources of Pennsylvania, by James D. Sisler and John F. Reese.
IV. Analyses of Pennsylvania Bituminous Coals, by United States Bureau of Mines.

To meet immediate demands most of Part III was issued in condensed form as a series of mimeographed bulletins. Advanced condensed descriptions of the coal beds of the State by counties were also presented in mimeographed form, but without rock sections or coal bed sections. Parts II and IV have been issued in printed form as this is written. Indeed, Part IV is in its second edition.

Part I of the Introductory Volume deals with general information on coal, its character, origin, classification, and includes brief descriptions of the bituminous coal beds and of the bituminous coal fields, and a word on the mining and use of Pennsylvania coal. In writing it the author has had in mind the many requests from the schools of the State for something general on coal.

Aside from the fact that the writer has been a special student of coal for over 30 years, and has made detailed surveys of coal fields from Rhode Island to Texas and California, he was in more or less direct charge of surveys in the coal fields of Pennsylvania by the United States Geological Survey from 1904 to 1919, and visited many of the fields of the State in that connection, and made detailed surveys personally of about 700 square miles in the Clearfield district.

Much additional information was obtained by Mr. Sisler who spent one season in a reconnaissance study of all those parts of the bituminous coal field not covered by recent detailed surveys. In this work he traveled nearly ten thousand miles, visiting nearly all of the mining districts and getting hundreds of sections of the coal. In addition, Mr. L. D. Woodworth spent many months in the field sampling coal. The samples were analyzed by the U. S. Bureau of Mines at Pittsburgh under a cooperative arrangement with this Bureau. During the summers of 1920 and 1921 E. G. Hill was engaged in similar work. Later, in cooperation with the Federal Coal Commission, Mr. Sisler visited the several mining districts and studied mining methods as bearing on losses of coal mining. Further, this Survey has had the hearty cooperation of the State Department

of Mines, and a large amount of additional data has been supplied by the Mine Inspectors for that Department, who have furnished sections and other details of all of the mines inspected by them. This volume is therefore not merely a compilation, but the result in part of very recent surveys.

COAL

Coal is a complex aggregate of plant remains partly decayed, more or less affected by earth pressures and heat, and converted into a rock-like material of great value for the production of heat and of many useful substances. It occurs in the earth in beds usually several feet thick, and of great extent. It consists pricipally of carbon, in part free (?) and in part combined with hydrogen and oxygen, with various impurities, some derived from the plants and some extraneous. It is of several kinds closely related in origin, character, and composition.

Coal is widely distributed over the earth, being found in many countries, in rocks of many ages, and occurs in many beds underlying thousands of square miles.

Physical Characters—Macroscopic

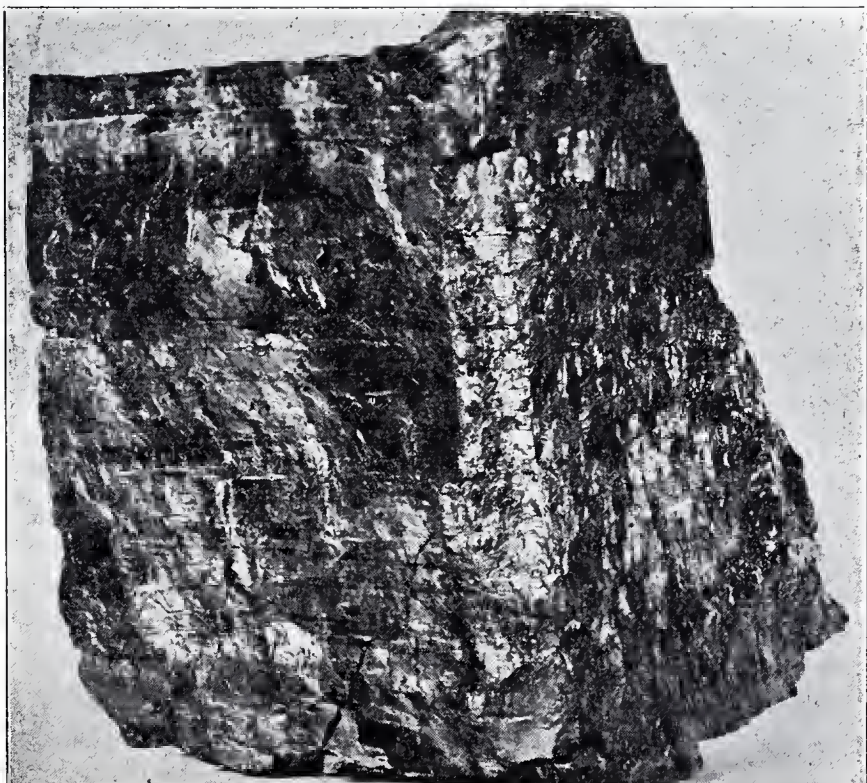
Macroscopic characters are those that can be observed without the use of a microscope, such as color and hardness, in contrast with those requiring examination with a microscope.

Color. Though coal is of many kinds, it is all black or brown. This is its most characteristic feature as observed in the mass. The black color is characteristic of the coal even when powdered or reduced to smoke (though the smoke may appear gray or yellow), or in weathered outcrops. Young coals, such as lignite, may have a distinctly seal-brown color, but all coals except lignites are distinctly black. Cannel coal differs from other bituminous coals in having a brown streak when rubbed on a white rough surface.

Banding. Examined closely, most coals are seen to consist of alternate or irregular bands of bright and dull coal. (See Plate III). Commonly the bright bands are lenticular, the lenses being often only a few inches long. Commonly the banding is irregular. A block picked at random may be nearly all dull coal with a few thin streaks of bright coal, while another piece from the same pile may be nearly all bright coal. Some coals, as certain anthracites, are all bright; others, as certain splint coals, are all dull. In certain coals, as the Brazil block coal of Indiana, the bands are very thin and alternate regularly.

The bright bands in coal have long been called "glance" coal. In

A. Block of coal showing bright and dull bands. The two are better distinguished in this piece because the dull coal here carries a high ash content grading over into bone.



B. Block of rich coal showing thin streaks of bright coal and more characteristic appearance of dull coal.

Photographs showing typical appearance of coal.

Photographs by courtesy U. S. Bureau of Mines.

recent years the term vitrian has been applied in England, and anthraxylon in the United States. The dull bands have been called durain in England, and attritus in the United States.

Many coals, when split open along bedding planes in the dull coal, show faces resembling charred wood, known as mineral charcoal or "mother of coal," or "coal rash." In England this material is called fusain. The nature of these several bands will be discussed beyond.

Structure or grain. Most coal is massive, that is, it has no observable grain. This does not apply to the mineral charcoal which has the cellular structure of charred wood, nor does it apply to the lowest rank of coal, lignite, in which the structure appears as woody, fibrous, or earthy. Some lignite resembles a section cut out of a log jam in which the spaces have been filled with small wood fragments. The massive structure of some coal extends entirely through the bed or beds, while other coals show many horizontal seams or planes of splitting. Indiana block coal, which consists of thin alternating bands of bright and dull coal, splits readily along these dull planes. The term grain is also used in connection with the fracture of coal, which see.

Luster. Coals differ in luster from a dull black quite without luster to luster like black glass (vitreous). Some anthracite has such a luster, and when cut and polished for a desk ornament or other object looks like black glass or black-glazed chinaware. Between these extremes is a satiny luster characteristic of cannel coal. Some cannel coals show a decided sheen.

Streak. It has been found that most rocks or minerals, when rubbed on a plate of rough porcelain, will leave a "streak." The streak may be the same as or differ greatly from the color of the mineral as a whole. This is true also of coals. Anthracite and ordinary bituminous coal are black in color and streak. Cannel coal, which may be quite black in the piece, is brown in streak. Lignite or brown coal, as might be expected, has a brown streak.

Hardness. Coal differs in hardness, from lignite soft enough to be broken or crushed in the hand or scratched by the finger nail to anthracite so hard and brittle that it fractures almost like glass. Some splint coal is so tough that it breaks across the bedding only with great difficulty although it splits readily along the bedding. Certain fairly hard coals, such as the low volatile coals of central Pennsylvania and Virginia, are very tender and in mining commonly crush to fine particles, some of it little more than powder. This is especially true where the coal is slightly weathered. Such coals are commonly sold run-of-mine. The same tenderness is characteristic of some of the soft (or semi) anthracites. Splint coals are distinguished in part by their toughness, which makes them difficult

to mine. Cannel coal likewise is commonly very firm, mining with little breakage and standing shipment well. Indeed, in some places cannel coal is so resistant that it has been used for barn foundations and stepping stones.

Fracture and cleavage. Some coal breaks with an irregular fracture, that is, in any direction, and with a variety of surfaces. Some coal, called cubical coal, breaks with smooth, rectangular faces into cubes of different sizes. (See Plate IV). Other coals, such as cannel and anthracite, break with rounding faces like the surface of a shell (conchoidal). (See Plate VIII B).

Jointing in coal is thought to be a result of pressure on the coal in the bed. Where beds have been little disturbed by thrust pressure the joints may be far apart, 3 to 4 feet or more; where the coal has been much disturbed the joints may be only a few inches apart. Where the joints are far apart the coal may mine out in cubes the full thickness of the bed and much too heavy to move. Where the joints are close together the coal commonly mines only in small cubical blocks bounded by joint faces. If the pressure has been great enough the coal may be so completely intersected with small joint planes that even when crushed to a powder the particles still have the cubical shape. This subject will be taken up again in discussing the coal beds.

Coals in which these joints vertically across the bedding are about as pronounced as the bedding planes are called short-grained coals. In other places, where there has been very great horizontal pressure, the vertical planes are so much more pronounced that the coal tends to break more readily in vertical lines than horizontal lines. Such coal in mining may break out in long blocks or "sticks" the full thickness of the bed in length and only a few inches square horizontally. Such coal is called stick coal or long-grained coal.

Splint coal is usually characterized by a hackly fracture, often resembling splintered wood.

Subbituminous coal, none of which occurs in Pennsylvania, has a different fracture, resembling the checking of china and apparently due to the drying out of the material when exposed to the air.

Weight—specific gravity. By weight of coal may be meant either the weight of a cubic foot of coal in the bed or the weight of a given volume of mined and broken coal. The weight of the coal in a bed is determined by first finding the specific gravity and multiplying that by 62.5 pounds, the weight of a cubic foot of water. Specific gravity means the weight of coal compared with the weight of an equal volume of water. If the specific gravity of a given coal is 1.3, it is 1.3 times as heavy as water, or it weighs 1.3 times 62.5 or 81.25 pounds per cubic foot. With this information it is possible to com-

PLATE IV.

A. Piece of coal showing rectangular block jointing or cleat. Most coal beds are intersected by two systems of vertical joints nearly at right angles. As the coal is mined it tends to break down into irregular blocks or cubes, bounded by two bedding planes and four vertical joint planes.

B. Pieces of Clearfield coal showing "long grain" or dominance of vertical jointing. Sometimes called "stick coal." This coal breaks more readily across the bedding than with it. Blocks of coal 6 by 6 inches and the full thickness of the bed are often seen. The vertical grain is due to horizontal pressure which has turned all particles so that their longest axis is vertical or transverse to the pressure.

Photographs showing structure of coal.

Photographs by courtesy U. S. Bureau of Mines.

pute the number of tons of coal in a bed of coal of any thickness or acreage.

The weight of a cubic foot of solid coal differs according to the percentage of carbon or the percentage of ash. Aside from the ash the carbon is the heaviest element of the coal. Low-carbon coal runs as low as 1.25 in specific gravity. Anthracite ranges from 1.40 to 1.50. Most of the bituminous coals of Pennsylvania lie between 1.30 and 1.40. The ash or shale alone has a specific gravity of 2.25 to 2.50, nearly double that of pure coal (ash and sulphur-free). The specific gravity of coal rises according to the amount of ash contained. Coal containing pyrite (lenses of "sulphur") is still heavier, as the specific gravity of pyrite is about four times that of pure coal.

A cubic yard of solid, low-ash Pennsylvania bituminous coal will weigh just about a long ton, or about 1.1 short tons. If this cubic yard of solid coal be broken up, as is done in mining, its volume will increase, the volume depending on the size of the lumps and whether all are of one size or not. The larger the lump the smaller the weight of a cubic foot. A cubic foot of broken coal of several sizes will weigh more than the same volume of coal of one size because the small sizes tend to fill in the spaces between the lumps without adding to the bulk of the coal.

In the following table are brought together a number of determinations of the weight and specific gravity of Pennsylvania bituminous coals, to which have been added a selection of similar determinations of anthracite for comparison.

*Table of Weights and Specific Gravity of Pennsylvania Bituminous Coals**

Coal bed or mine	County	Location	Specific gravity	Number cu. ft. per ton of 2,000 pounds		Average weight lbs. per cubic foot	
				Solid coal	Loose coal	Solid coal	Loose[1] coal
[2] Freeport, Lower,	Cambria,	Saxman,			38.46		52.0
[2] Freeport, Lower,	Clearfield,	DuBois,			37.74		53.0
[2] Freeport, Lower,	Clearfield,	Jefferson Line,			39.22		51.0
[2] Freeport, Lower,	Clearfield,	DuBois,			36.7		54.5
[2] Freeport, Lower,	Clearfield,	Carnwarth,			40.0		49.5
[2] Freeport, Lower,	Clearfield,	Curwensville,			39.22		51.0
[2] Freeport, Lower,	Elk,	Dagus Mines,			40.0		50.0
[2] Freeport, Lower,	Elk,	Crenshaw,			38.84		51.5
[2] Freeport, Lower,	Jefferson,	Brockwayville,			38.46		52.0
[2] Freeport, Lower,	Jefferson,	Pardoe,			40.0		49.5
[2] Freeport, Lower,	Jefferson,	Reynoldsville,			39.6		50.5
[2] Freeport, Upper,	Armstrong,	Yatesboro,			40.0		49.5
[2] Freeport, Upper,	Armstrong,	Sagamore,			39.6		50.5
[2] Freeport, Upper,	Armstrong,	Seminole,			39.6		50.5
[2] Fulton,	Huntingdon,	Robertsdale,			37.04		54.0
[2] Kittanning, Lower,	Armstrong,	Leechburg,			40.0		50.0
[2] Kittanning, Lower,	Cambria,	Portage,			38.84		51.5
[2] Kittanning, Lower,	Cambria,	Dunlo,			38.46		52.0
[2] Kittanning, Lower,	Cambria,	Expedit,			38.46		52.0
[2] Kittanning, Lower,	Cambria,	South Fork,			39.22		51.0
[2] Kittanning, Lower,	Cambria,	Twin Rocks,			38.10		52.5
[3] Kittanning, Lower,	Cambria,	Ehrenfeld,	1.36	23.53		85.00	
[2] Kittanning, Lower,	Clearfield,	Madera,			38.46		52.0
[2] Kittanning, Lower,	Clearfield,	Madera,			38.46		52.0
[2] Kittanning, Lower,	Clearfield,	Hawk Run,			40.0		49.5
[2] Kittanning, Lower,	Clearfield,	Osceola Mills,			38.10		52.5
[2] Kittanning, Lower,	Jefferson,	Summerville,			40.0		49.5
[2] Kittanning, Lower,	Somerset,	McDonaldton,			38.1		52.5
[2] Kittanning, Lower,	Somerset,	McDonaldton,			38.46		52.0

*The Coal Catalog, Pittsburgh, Pa., p. 1121, 1924.
[1]Lump, nut and slack unless otherwise noted.
[2]U. S. Bureau of Mines.
[3]Coal Miners' Pocketbook, 11th Edition.

*Table of Weights and Specific Gravity of Pennsylvania Bituminous Coals**

Coal bed or mine	County	Location	Specific gravity	Number cu. ft. per ton of 2,000 pounds		Average weight lbs. per cubic foot	
				Solid coal	Loose coal	Solid coal	Loose[1] coal
[3] Kittanning, Lower,	Somerset,	Kimmelton,	1.39	23.00		86.88	
[2] Kittanning, Upper,	Cambria,	Portage,			38.84		51.5
[2] Kittanning, Upper,	Fayette,	Rogers Mills,			42.55		47.0
[2] Kittanning, Upper,	Somerset,	Somerset,			37.74		53.0
[2] Kittanning, Upper,	Somerset,	Holsopple,			36.0		55.0
[2] Kittanning, Upper,	Somerset,	Ralphton,			37.38		53.5
[2] Kittanning, Upper,	Somerset,	Ralphton,			38.46		52.0
[2] Kittanning, Upper,	Somerset,	Boswell,			36.0		55.0
[2] Pittsburgh,	Allegheny,	Epton,			43.01		46.5 (Lump)
[3] Pittsburgh,	Allegheny,	Bruecton,	1.36	23.53		85.00	
[2] Pittsburgh,	Washington,	Wyano,			40.0		49.5
[2] Pittsburgh,	Washington,	Atlasburg,			41.24		48.5
[2] Pittsburgh,	Washington,	Shoring.			36.7		54.5 (Lump)
[3] Pittsburgh,	Washington,	Ellsworth,	1.33	24.06		83.13	
[3] Pittsburgh,	Washington,	Ellsworth,	1.31	24.42		81.88	
[3] Pittsburgh,	Westmoreland,	Ligonier,	1.41	22.69		88.13	
[3] Pittsburgh,	Westmoreland,	E. Millsboro,	1.33	24.06		83.13	
[3] Pittsburgh,	Westmoreland,	Greensburg,	1.35	23.70		84.38	
[2] Wilson No. 2 Mine,	Clarion,	Clarion,			42.55		47.0

*The Coal Catalog, Pittsburgh, Pa., p. 1121, 1926.
[1]Lump, nut and slack unless otherwise noted.
[2]U. S. Bureau of Mines.
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*Table of Weights and Specific Gravity of Pennsylvania Bituminous Coals**

Coal bed or mine	County	Location	Specific gravity	Number cu. ft. per ton of 2,000 pounds		Average weight lbs. per cubic foot	
				Solid coal	Loose coal	Solid coal	Loose coal
[1] Big Diamond,	Schuylkill,	Phoenix Pk. No. 2 Colliery,	1.52	21.05		95.00	
[1] Buck Mountain,	Schuylkill,	Middle Creek Colliery,	1.55	20.64		96.88	
[2] D. & H. Anth.,					35.1		57.0 (Egg)
[2] D. L. & W. Anth.,					35.4		56.5 (Chestnut)
[1] Holmes,	Schuylkill,	Middle Creek Colliery,	1.55	20.64		96.88	
[1] Lykens Valley No. 2,		Heits Colliery,	1.50	21.33		93.75	
[1] Lykens Valley No. 5,	Schuylkill,	E. Brookside Colliery,	1.44	22.22		90.00	
[1] Lykens Valley No. 6,	Schuylkill,	Lincoln Colliery,	1.47	21.77		91.88	
[1] Lykens Valley No. 4,	Schuylkill,	Lincoln Colliery,	1.42	22.55		88.75	
[1] Lykens Valley No. 3,	Schuylkill,	Lincoln Colliery,	1.45	22.07		90.63	
[1] Lykens Valley No. 1,	Schuylkill,	Lincoln Colliery,	1.48	21.62		92.50	
[1] Mammoth, Bottom,	Schuylkill,	Otto Colliery,	1.59	20.12		99.38	
[1] Mammoth, Top,	Schuylkill,	Middle Creek Colliery,	1.57	20.38		98.13	
[1] Primrose,	Luzerne,	Franklin Colliery,	1.57	20.38		98.13	
[1] Primrose,	Schuylkill,	Middle Creek Colliery,	1.51	21.19		94.38	
[3] Anthracite,	Schuylkill,				37.2		53.7 (Large egg)
[3] Anthracite,	Schuylkill,				36.4		55.0 (Small egg)
[3] Anthracite,	Schuylkill,				34.1		58.6 (Chestnut)
[3] Anthracite,	Schuylkill,				34.2		58.5 (Range)
[3] Anthracite,	Schuylkill,				33.6		59.6 (Buckwheat)
[3] Anthracite,	Schuylkill,				36.4		55.0 (Pea)
[1] Skidmore,	Luzerne,	Franklin Colliery,	1.59	20.12		99.38	

*The Coal Catalog, Pittsburgh, Pa., pp. 1120-1121, 1926.
[1]J. J. Tierney, Philadelphia, Pa.
[2]U. S. Bureau of Mines.
[3]Commercial Testing and Engineering Co., Chicago, Ill.

Physical Characters—Microscopic

Methods of study. It has long been assumed that coal is of vegetal origin. The close association of coal with plant remains in the rocks above and below, the presence of mineral charcoal layers in the coal bed, the occasional recognition of plant structures in the coal itself, and especially the evident derivation of coal from peat through intermediate stages, left little doubt in the minds of most people, even a hundred years ago, that coal beds are the fossil remains of old peat bogs or log jams, or other accumulation of vegetal matter. Within the last century, however, an increasing knowledge of coal has been obtained by the aid of the microscope, which has demonstrated conclusively that all coal once was vegetation and has shown just what kind of vegetation. Different kinds of vegetation are found in different kinds of coal.

Microscopic studies of coal have been in progress for many years. Early studies, although handicapped by inadequate methods of preparing the material for study, led to the recognition of many plants by the presence of their spores. These are small dust-like bodies of such plants as ferns, ground pine, and spagnum moss, by means of which the plants spread. Seed-bearing plants had not appeared when the coal in Pennsylvania was laid down. By 1900 considerable progress had been made in our knowledge of coal by use of the microscope.

In the early part of the present century better methods of preparing coal for examination were developed by Professor Jeffries and others, and made possible a large advance in our knowledge of coal. More recently Reinhardt Thiessen of the U. S. Bureau of Mines, Homer G. Turner of Lehigh University, Clarence A. Seyler of Swansee, Wales, and others, have still further perfected our methods of preparing material for the microscope and have obtained a great fund of detailed information regarding the constitution of coal.

In the Jefferies and Thiessen methods the coal is first prepared by the removal of mineral substances by acids, especially hydrofluoric acid. Then the coal is softened with alkalies. These processes may require weeks in order that the result may be obtained without affecting the character of the coal. Small pieces of coal are then clamped in a microtome, an instrument like a small sausage cutter that slices off sections 1-5000th to 1-8000th of an inch in thickness. The whole process, as might be imagined, requires skill and patience.

A. A modern peat bog.

B. Horsetails (Equisetum Arvense). A living survivor of the plants that formed the Pittsburgh coal bed. The Equisetum of Carboniferous time grew to much larger size than living species.

Photographs showing sources of coal.

Photographs by courtesy U. S. Bureau of Mines.

Dr. David White[1] of the United States Geological Survey has described the cutting of these specimens and what they show, as follows:

"The preparation of such a thin section is a most delicate task. First a thin flat piece from a lump is sawed out and then ground down smoothly until it is reduced nearly to a film—that is, until it averages about 2/10,000ths of an inch in thickness. This thickness—or rather thinness—would correspond to the leaves of a book in which 10,000 pages make a volume only one inch in thickness.

"Seen through the microscope such slices of coal are found to be translucent and if treated with certain chemicals before grinding, they will be so beautifully translucent that they may be examined by a microscope which magnifies them more than 1,800 times.

"Under the microscope the coal is no longer dark as night, or sooty or forbidding. In the cross section of that dirty lump one beholds a landscape in brown and gold. Golden links in serried chains bound in filigree fill portions of the view.

"The links are the cross sections of the cells of pieces of wood, of twig, branch or log that enter into the product we call coal. Each cell in the wood is a jewel box of gold. In the hollow interior where once were protoplasm, starch and other substances embracing the very life of the plant, we find a transparent amberlike substance clouded with sepia and containing clusters of shining crystals of utmost minuteness, together perhaps, with tiny glistening globules of gas. Stem of leaf and fern and scale of catkin or cone, are seen in tissues traced in saffron and orange, straw-color and russet.

"Scattered here and there are a thousand spores of club moss, fern or fungus and pollen of many kinds of flowers,* now appearing as ovals, clasps and crescents of luminescent brass or antique gold. Festooning skeins in brown, knit with silver representing cross sections of fragments of inner tissue of leaf or bud are perhaps present: and resins of different kinds, brownish, amber, yellow or red, stud the pattern like precious stones. Real amber used in jewelry is, you know, a fossil resin. Yonder mesh of old gold sealed over with a mosaic in glistening topaz-yellow is a piece of the outer wall of a leaf. The fragile labyrinths traced in pale yellow and silver are the cross sections of fragments of 'mineral charcoal,' the so-called 'mother of coal.' The scene changes from area to area and from specimen to specimen.

"All these details of tracery and mosaic are set in a background—the groundmass—of cinnamon verging into sepia and brownish black, which fills the spaces. This composes the dark shadows of the picture."

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[1]Science, March 13, 1925.

*Flowers bearing pollen were rare when most of the coal of Pennsylvania was laid down; they were very small in size, of low orders, and unattractive in color.

Anthracite contains so much carbon that it is almost impossible to get sections thin enough and yet strong enough to study by the preceding process. A new process has therefore been devised by Turner and Seyler, and others, in which a piece of coal is first polished to a smooth surface, dried in a drying oven, and then immediately etched by bringing it to a red heat, using the oxidizing flame of a blow pipe. This slight oxidation or burning reveals the plant structure without destroying the polish of the specimen. The specimen can then be examined by reflected light by the microscope used for the study of metals. Seyler has used both the Turner method and a modification of the Winter method, using chromic and sulphuric acids for etching.* The results of these studies may be briefly summarized as follows:

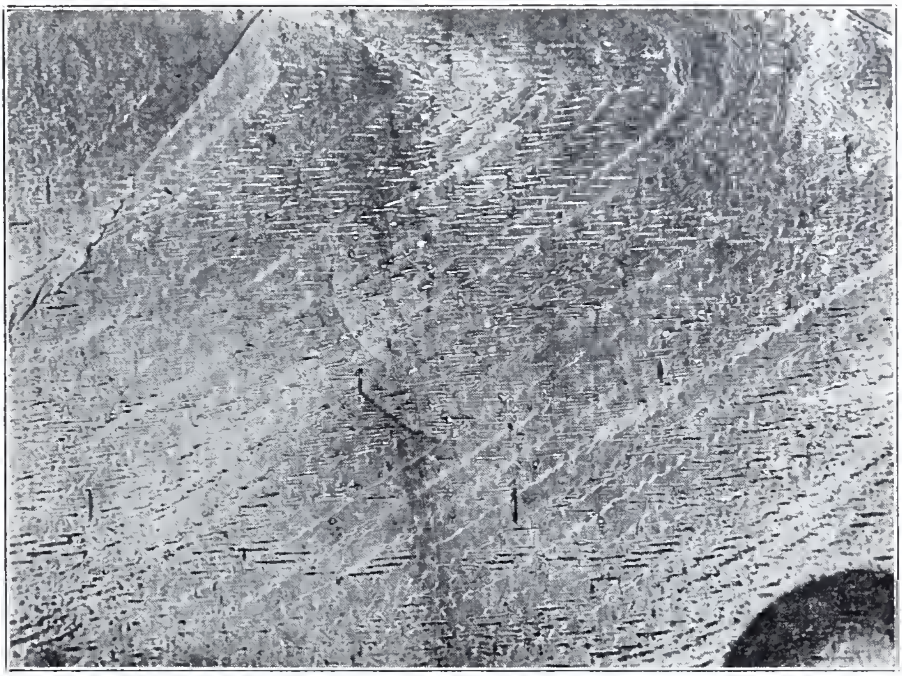
Bright bands, anthraxylon. The bands of bright coal have been shown by the microscope to consist of wood changed into coal, as they almost invariably show woody cell structure either well preserved or in slight traces. The lenticular shape of these bands in the side of a block of coal is due to the woody stems having been flattened to a lens-like cross section. If the face of a piece of coal cuts across the stem nearly at right angles the lens will be short. If the face cuts across the stem at a long angle the bright bands will be long and may lengthen out into a tapering ribbon many feet in length.

The wood is not of such trees as we are familiar with, hard wood, pines, or spruces, but of tree ferns and other giant plants related to club mosses, and plants of the order of horsetails. Most of the low orders of plants had some species growing to large tree size at the time of the "Coal Measures." The bright bands may be 6 inches thick in the younger coals where little compressed and several feet long, but are commonly much thinner and more compressed in the older coals, such as those of this State.

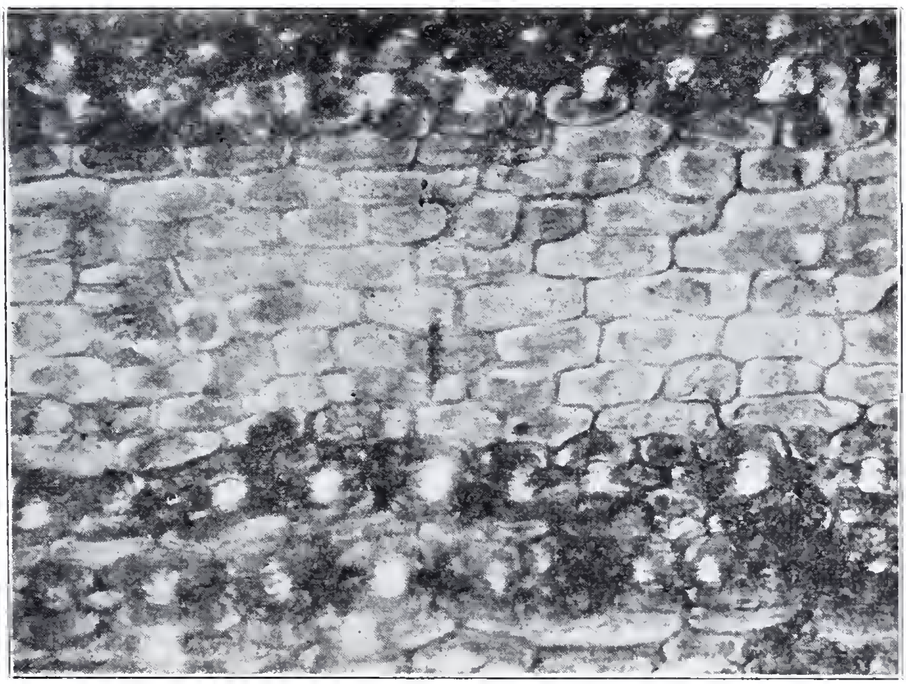
Dull coal or attritus. As suggested by the name these dull streaks of coal prove, under the microscope, to be composed of an accumulation of small pieces of wood, leaves, branches, and bark, besides pollen grains, spores, and the resinous, waxy, and fatty contents of cells and tissues, which are more or less resistant to decay, the whole making a tangled mass of refuse. The cellulose which makes up the bulk of the plant when alive largely disappears in the early stages of decomposition and hardly appears in the coal. The appearance of dull coal on the face of a block is shown in Plate IV.

Spores. Of special interest, because they may prove to be a means of identifying the different coal beds, are the spores, referred

*Several papers on related subjects were given at a symposium on the origin and constitution of coal at the February 1925 meeting of the American Institute of Mining and Metallurgical Engineers. They are published in Mining and Metallurgy for February, 1925.



A. Plant structure in coal, from Buxton, Ill.



B. Woody structure in anthraxylon, or bright coal, from Royalton, Ill. (magnified x 200).

Photographs showing woody structure of bright or "glance" coal.

Photographs by courtesy U. S. Bureau of Mines.

to above. These have been studied for several years by Mr. Thiessen[1] of the U. S. Bureau of Mines, who is endeavoring to determine which species of plants, as recognized by the spores, are characteristic of the several coal beds. These spores, which resemble in appearance the pollen of flowering plants are produced in great quantity in certain stages of growth. Certain plants produce two kinds, large and small, called megaspores and microspores. The large ones may be $\frac{1}{8}$ inch in diameter, the small ones will range from 1-2500th to 1-200th of an inch in diameter. In Plate VII B are shown some of these spores as worked out by Mr. Theissen.

Mineral charcoal. Mineral charcoal occurs in coal in thin layers lying with the bedding. When the coal is split open along one of these layers the surface presented resembles charred chips or fragments of wood, dull black in color, showing usually obvious woody structure. Analyses, however, do not show so complete conversion into carbon as might be expected from the appearance. Certainly the process has not been as complete as with ordinary charcoal. A sample from Indiana block coal, as analyzed by E. T. Cox is, as follows:

*Analysis of mineral charcoal, by E. T. Cox.**

Proximate	Per cent	Ultimate	Per cent
Moisture	3.50	Carbon	82.70
Fixed carbon	63.00	Hydrogen	4.77
Volatile matter	32.00	Oxygen	8.81
Ash	1.00	Ash	1.00
Sulphur	.90	Sulphur	.90
		Nitrogen	1.74

Cannel coal. Under the microscope cannel coal appears to be composed largely of the tough covers of spores (exines) both large and small, but especially of the small spores. These are imbedded in a homogeneous, dark gray mass, thought to be nearly-macerated spore covers. Wood is but little observed in cannel coal. The absence of large spore cases and the fragmentary condition of those observed, suggests that they were broken up before they were laid down and make part of the groundmass in which the small spores are imbedded.

[1]Carnegie Institute of Technology, Bulletin 10. Coal Mining Investigations. Correlation of coal beds of the Allegheny formation of Western Pennsylvania and Eastern Ohio, by Reinhardt Thiessen and Ford E. Wilson. Pittsburgh, Pa., 1924.
U. S. Bureau of Mines Bulletin 38, The origin of coal, by David White and Reinhardt Thiessen, 1914.
*Geological Survey of Indiana, Seventh Annual Report, 1875, p. 12.

A. Dull coal as seen through the microscope; white spots are spore exines (horny spore cases).

B. Three megaspore exines isolated from coal from Shelbyville, Ill. (x35).

Photographs (microscopic) of dull coal and spores.

Photographs by courtesy U. S. Bureau of Mines.

Boghead coal or torbanite. Boghead coal differs from ordinary cannel in its extremely high content of volatile matter, often 60 to 70 per cent and over. Recent studies have led Mr. Thiessen to suggest that algae or seaweeds have contributed largely to the composition of this coal.

X-ray studies of coal. Coal, like the human body, is composed principally of carbon, hydrogen, and oxygen, and, like it, is more or less transparent to X-rays. The ash of coal, however, consists of elements with much higher atomic weights, absorbs X-rays passed through coal, and throws a shadow on a fluorescent screen in a darkened room, or on a photographic plate. Because of this it is possible by passing X-rays through a piece of coal to determine the distribution and roughly the amount of ash in a coal. Later work may make possible the determination of the character and composition of the ash.[1]

Chemical Character of Coal.

Plant chemistry. Mr. Reinhardt Thiessen[2] has recently presented an excellent paper on the constitution of coal in which he gives the results of an elaborate study of the chemical materials in plants. The number of such substances in plants is very great. For the purpose of this report it is necessary only to refer to these by classes with suggestions as to the part they play in coal formation. The living herb, shrub, or tree grows actively only at the tip of the roots, branches, and leaves, and in a narrow zone between the bark and wood called the cambium. During the growth of this zone (the growth season is very short) cells which split off from the outside of the cambium make the bark, and cells from the inside produce wood by the addition of many other substances that incrust the cell walls. The added substances include especially lignin, also resins, waxes, fats, and other materials. The original cells consist of almost pure cellulose.

In addition to wood and cellulose may be mentioned starches and sugars, gums, mucilages, pectins which form jellies, tannins, turpentine, camphors, and other materials. These materials differ greatly in their resistance to solution in water and to bacterial and fungal decay. Bacteria attack vegetal matter, taking up readily the water-soluble portions. They also produce enzymes, substances with which they can dissolve other parts of the vegetal matter not soluble in water. The result of the bacterial attack on the plant matter is the removal or destruction of the starches, sugars, cellulose, and some other substances, and their change into new materials, alcohols, etc., which in the end may be oxidized to CO_2 and water and

[1] St. John, Ansel: X-ray studies of coal and coke; Amer. Inst. of Min. and Met. Engineers, pamphlet No. 1587-E.

[2] Thiessen, Reinhardt: The constitution of coal; Mining and Metallurgy, New York, March 1925.

A. Pittsburgh coal, showing parting below "bearing in." Note also bright and dull coal and cleavage faces which form faces of block at front and either side.

B. Cannel coal Note massive structure and conchoidal fracture.

Photographs contrasting bituminous and cannel coals.

Photographs by courtesy U. S. Bureau of Mines.

dissipated into the air. The extent to which these processes go on depends on the physical conditions surrounding the laying down of a body of vegetal matter, and whether these conditions favor stopping the process and preserving the end products. Under normal conditions, such as in our fields and forests, bacterial decay proceeds until little or nothing is left. Microscopic study of coal shows that in the formation of coal beds such decay has been stopped fairly early in the process, leaving little of the water-soluble materials but preserving much of the less readily decomposable materials.

Analysis of coal. There are several ways of arriving at the constitution or composition of coal. An ultimate analysis shows the percentage of the several elements contained; as carbon, hydrogen, oxygen, etc. A proximate analysis shows the percentage of a coal that will pass off when it is heated at a low temperature, supposedly as moisture; the percentage passing off at a higher temperature, called the combustible volatile matter; the percentage that will pass off at a still higher temperature, called the fixed carbon; and the percentage of ash left at the end of the process. The sum of these percentages should equal 100. These percentages differ according to the temperature and pressure used in the process, and standardized methods are required to produce comparable results. The third method is the determination of the amount of different substances that can be dissolved out of the coal by the use of various solvents. The ultimate analysis is definite and reliable, but does not give any clue to the various combinations of the elements which are known to exist in the coal.

In discussing the chemistry of coal it is necessary to assume some knowledge of the different kinds of coal, as will be discussed farther on under origin and classification. For the present purpose coals may be classed as of three types: normal or caking, non-caking or splint, and cannel. The terms "rank" or "class" have been applied to the stages in the process of change from peat to anthracite. In general terms, coals may be spoken of as lignite, subbituminous, bituminous of several ranks, semibituminous, semianthracite, and anthracite.

Chemically it has not yet been possible definitely and certainly to distinguish caking from non-caking coals. Analyses of coals from the same region, one caking and another non-caking, can not be distinguished, nor is it easy to distinguish high-rank cannel coal from other coals of corresponding rank. Low-rank coals are those nearer the peat end of the series and high-ranking coals are those nearer the anthracite end. Cannel coals are readily distinguished among coals of bituminous rank chemically in the ultimate analysis by the high percentage of hydrogen, in proximate analysis by the high percentage of volatile matter, and physically by many characters as described beyond.

*Ultimate analysis.** Ultimate analyses determine and show percentage of the elements contained in the coal. As a rule only carbon hydrogen, oxygen, nitrogen, sulphur, and ash are determined. A study of the analyses of coals of different ranks reveals that coals of different rank differ greatly in percentage of the elements named, as shown by the following table, in which analyses are given of the coal as received, but with the ash removed.

Table of ultimate analyses of coal, by rank.

Coals	As received ash free					As received; ash, sulphur, and nitrogen free			Dry, ash, sulphur, and nitrogen free		
Analyses generalized, but representative of classes from the regions named	Carbon	Hydrogen	Oxygen	Nitrogen	Sulphur	Carbon	Hydrogen	Oxygen	Carbon	Hydrogen	Oxygen
Wood	37.0	7.4	55.5	0.1	-----	37.0	7.4	55.6	49.2	6.3	44.5
Peat	39.3	7.4	51.8	0.5	1.0	40.0	7.4	52.6	59.0	6.0	35.0
Lignite, North Dakota	42.5	7.3	44.5	0.7	1.0	43.3	7.4	49.3	72.0	5.5	22.5
Subbituminous. Wyoming	56.5	6.5	35.0	1.0	1.0	57.5	7.0	35.5	78.0	5.5	16.5
Bituminous, Illinois	71.0	5.5	20.5	1.5	1.0	73.0	6.0	21.0	82.0	5.5	12.5
Bituminous, Obio; N. W. Penna.	77.0	5.5	15.0	1.5	1.0	79.0	5.9	15.1	84.5	5.5	10.0
Bituminous, Pittsburgh. Pa.	82.5	5.4	9.6	1.5	1.0	84.5	5.7	9.8	87.5	5.5	7.0
Bituminous, Connellsville, Pa.	85.0	5.0	7.5	1.5	1.0	87.0	5.3	7.7	89.5	5.5	5.0
Semibituminous, Clearfield, Pa.	86.0	5.0	7.0	1.0	1.0	88.0	5.0	7.0	90.5	5.0	4.5
Semibituminous, Broad Top, Pa.	87.0	4.5	6.0	1.0	1.0	89.0	4.5	6.5	91.5	4.5	4.0
Semianthracite, Bernice, Pa.	88.0	4.0	6.0	1.0	1.0	90.0	4.0	6.0	92.5	4.0	3.5
Anthracite, Penna.	90.0	3.0	5.5	0.5	1.0	91.5	3.0	5.5	94.0	3.0	3.0
Graphite, Chester County, Pa.	100.0										

The above table contains selected ultimate analyses of a series of coals and of peat and wood. They are arranged in order to express stages in the change from woody material to anthracite. The first group of analyses shows the elements in the coal just as mined but recalculated to the ash-free condition; in the second group recalculated to the ash, sulphur, and nitrogen free condition; in the third group to the moisture, ash, sulphur, and nitrogen free condition, or, as it is often designated, the "pure coal" condition.

The table brings out clearly, first, that while all coals consist principally of carbon, hydrogen, and oxygen, with minor quantities of other elements, the proportions of those elements differ greatly in different coals. Some coals have ten times as much oxygen as others, and some coals twice as much carbon as others. As arranged in the table the coals show a steady increase in the percentage of carbon from wood to anthracite, and a nearly compensating decrease in percentage of oxygen. The variation of hydrogen is not large, but there is a slight decrease from wood to anthracite. The nitrogen and sulphur are variable within narrow limits in all coals.

*For methods of analysis see the various bulletins of the U. S. Bureau of Mines giving analyses of coal.

The table given above does not include cannel coal. Cannel coal is distinguished in the ultimate analysis by its high hydrogen and low oxygen. In the table above the ratio of hydrogen to oxygen is from 1:8 to 1:1.5. In cannel coal the ratio of hydrogen to oxygen is about 1:1.2. True cannels have commonly 7 per cent or more of hydrogen, and less than 10 per cent of oxygen.

Coal does not consist simply of the elements carbon, hydrogen, and oxygen mixed together. It is known to consist of many compounds of those elements, probably mixed or loosely held together. The presence of certain compounds can be determined by dissolving them out with various solvents, or, if the coal be slowly heated, various compounds are driven off. It is not always possible to say whether the compounds so driven off existed in the coal or have been produced from other compounds by the heat.

Proximate analysis. For practical purposes breaking up the coal by heating yields results of highest value. Such a method of studying coal is called a proximate analysis. The coal is first heated mildly, which drives off a certain percentage of moisture. Whether this moisture existed as moisture in the coal is not always certain. It is known that if different coals, after a preliminary drying, are again placed in a moist atmosphere they will reabsorb an amount of moisture that differs for different coals, and is characteristic of any coal. Whether this reabsorbed moisture is simply held in the pore spaces of the coal or whether it enters into the chemical combination of the coal is still to be determined. The fact that the moisture content is characteristic of the several coals has led the writer to include it in the analyses of coals used for classification purposes. Second, the coal is more highly heated although without combustion, driving off what is called volatile combustible matter, or commonly the volatile matter. This consists mainly of compounds of carbon and hydrogen that will burn if ignited. It also includes more or less non-combustible matter, presumably moisture, so held that it is not driven off at the lower temperature. Whether this moisture is held in the coal in a different manner than the moisture first driven off, possibly in chemical combination, is not known. In the high moisture coals this "inert volatile matter" may constitute a considerable part of the volatile matter. Professor S. W. Parr has shown that it ranges from 4.2 per cent in a semibituminous coal to 14 per cent in an Illinois coal, and over 20 per cent in a lignite.

The presence of this "inert volatile matter" in the so-called combustible volatile matter, as reported, is another reason for including all of the moisture as determined under specified conditions in classifying coals. The volatile matter so driven off consists mainly of what is familiarly known as artificial or manufactured gas, used where natural gas is not available. There is now left the coke, con-

sisting of carbon and ash. By burning out the carbon the ash is left, and if the coal is weighed at each stage of the process it is possible to describe it as containing so much moisture, so much volatile matter, so much fixed carbon, and so much ash.

Such an analysis is more readily made than an ultimate analysis, and to the average user of coal conveys much more meaning. In marketing coals they are commonly distinguished and described in terms of volatile matter or fixed carbon. Market quotations are on "high volatile coal," "medium volatile coal," and "low volatile coal" of different sizes and grades. Recognizing that the character of the volatile matter differs with its volume in the coal, coal users judge of the type of furnace needed by the proximate analysis of a coal. Coal with a low content of volatile matter gives a short flame, and vice versa. Furnaces using powdered coal need a high volatile coal. It is thus apparent why to the trade the proximate analysis is desired rather than an ultimate analysis. In the following tables are shown typical average analyses of a series of coals. Coals selected are the same as those used in the ultimate analysis in a preceding table. In addition to the analyses proper, the table includes the "fuel ratio" (fixed carbon divided by volatile matter), and the B. t. u., expressing the heat value of the coal. To make the comparison easier all have been recomputed to a 7 per cent ash content.

Table of proximate analyses of coals, by rank

Coals	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Fuel ratio	Heat value B.t.u.
Wood, seasoned	25	55	19	1	....	1/3	6500
Peat	50	22	21	7	0.5	1±	4500
Lignite, North Dakota	40	25	28	7	1.0	1+	7000
Subbituminous, Wyoming	25	33	35	7	1.0	1+	9300
Bituminous, Illinois	15	36	42	7	1.0	1-1/6	11250
Bituminous, Ohio; N. W. Penna.	6	38	49	7	1.0	1-1/3-	13250
Bituminous, Pittsburgh, Pa.	3	34	56	7	1.0	1-1/2-	13850
Bituminous, Connellsville, Pa.	3	27	63	7	1.0	2-1/3	13850
Semibituminous, Clearfield, Pa.	3	20	70	7	1.0	3-1/2	14100
Semibituminous, Broad Top, Pa.	3	13	77	7	1.0	6-	14350
Semianthracite, Bernice, Pa.	3	7	83	7	1.0	12-	13750
Anthracite, Penna.	3	2	88	7	1.0	44	13600
Graphite, Penna.			100				

With the moisture retained, it is understood that if a sample is visibly wet when taken it shall first be dried until all visible moisture has been evaporated. Where the percentage of moisture is a critical matter it is suggested that the moisture determination be made under uniform conditions of 20° C. temperature and 15 mm. mercury-vapor tension.

Volatile matter. Volatile matter is determined by heating the coal in a platinum crucible in an electric furnace to a temperature of

950° C. for six minutes without contact with air. The loss of weight less the loss of moisture gives the percentage of volatile matter.

The volatile matter does not represent a single compound, but is made up of a number of compounds, the quantity and character of which depend in part on the temperature and conditions under which determined. The volatile matter contains not only the familiar "manufactured gas," but ammonia and tar, the first absorbed and removed and the second condensed and removed in the ordinary process of gas making. If the temperature at which the volatile matter is driven off is reduced, say to 450° C., the volume of fixed gas resulting would be much reduced and changed in character, and from 10 to 20 gallons of oil per ton of coal would condense out of the gas and vapor driven off.

Not only does the percentage of volatile matter differ in different coals, but the percentage of the elements in the gas differs as shown by the following table. These percentages are not obtained by analysis but by the usual method of determining the volume of carbon by subtracting fixed carbon from the total carbon, etc.

Composition of volatile matter of coals

Coals.	Per cent volatile matter in coal	Composition of volatile matter			B. t. u. of 1 per cent volatile matter
		Hydrogen	Carbon	Oxygen	
Wood, seasoned	55	9.1	23.3	67.6	67
Peat	22	6.5	45.0	48.5	95
Lignite, North Dakota	25	15.6	47.8	36.6	110
Subbituminous, Wyoming	33	11.7	48.0	40.3	115
Bituminous, Illinois,	36	11.7	66.6	21.7	133
Bituminous, Ohio; N. W. Penna.	38	13.0	63.1	23.9	143
Bituminous, Pittsburgh, Penna.	34	21.9	59.8	18.3	166
Bituminous, Connellsville, Penna.	27	19.2	65.3	15.5	170
Semibituminous, Clearfield, Penna.	20	22.8	61.7	15.5	200
Semibituminous, Broad Top, Penna.	13	28.6	54.4	17.0	210
Semianthracite, Bernice, Penna.	7	49.6	21.5	28.9	204
Anthracite, Penna.	2	47.0	19.0	34.0	220

The table shows that not only does the volatile matter decrease in going from wood to anthracite, but that the heat value of the volatile matter increases in that direction. The percentage of hydrogen increases to semianthracite, then decreases to anthracite. This may be accidental, as may be some other variations from a uniform increase or decrease of percentages.

The table suggests that the volatile matter of the low-rank coals is in fact largely water in combination with the other parts of the volatile matter. It can not be in the form of water vapor or it could be readily condensed out, which is not the case. The carbon in the

volatile matter is in the form of volatile carbon, that is, in such combination with hydrogen and oxygen that the resulting compounds are gases or tars. Actually the volatile matter contains a small percentage of nitrogen, making a combination with hydrogen that is absorbed as ammonia, and certain other elements including some of the sulphur and part, at least, of the combined moisture in the ash.

It is generally believed that the compounds existing in the volatile matter were not expelled unchanged from the coal, but are rather products of decomposition produced by the heat.

Fixed carbon. The fixed carbon in the proximate analysis is the carbon left after the expulsion of the volatile matter. Its condition in the coal before heating is not known. Remembering that the end of the process, graphite, is pure carbon, it seems possible that some at least of the fixed carbon exists in the higher rank coals as free or uncombined carbon. On this point more information is needed.

Ash. The ash is the unconsumed residue after heating the coal in an air current to a temperature of 700 to 750° C. It has been shown by Professor S. W. Parr that the percentage of ash determined in this way does not give the correct percentage as it occurred in the coal for the heat has driven off the combined moisture or water of crystallization, as possibly also some CO_2 and other materials of the original ash, changing its mineral character and reducing its weight.

Professor Parr, from his studies of Illinois coal, offers the following correction for ash of that coal: add 8 per cent of the ash to correct for combined moisture driven off; 5/8 of the percentage of sulphur content to allow for the difference in weight between pyrite or iron sulphide in the coal and iron oxide to which it is changed by heating; and a slight addition in some coals to allow for the CO_2 driven off where calcium carbide is present.

The ash is made up of a complex mixture of sand, shale, kaolin, gypsum, calcium carbonate, pyrite, etc.

In the following table are brought together analyses of the ash of tree leaves, stems, etc., placed beside the analysis of typical coal ashes, as given in "Coal," by E. S. Moore.[1]

[1]Moore, E. S., Coal, p. 52: John Wiley & Sons, New York, 1922.

Table showing composition of ash in plants and coals.

	A	B	C
SiO_2	0.014–0.222	15.2–64.7	45.24–50.23
Al_2O_3	0.38 –0.253	8.6–34.6	23.43–33.28
Fe_2O_3	0.15 –0.29	3.8–19.0	5.50–14.68
CaO	0.24 –1.45	1.0–18.1	2.76– 8.52
MgO	0.18 –0.72	0.4–10.0	0.78– 2.88
K_2O	0.30 –1.99	0.3– 2.9	– 3.83
Na_2O	0.07 –0.15	0.1– 5.3	
TiO_2	Trace –0.001	– 2.6	
P_2O_5	0.075–1.10	With Al_2O_3	0.26– 1.85
SO_3	0.14 –0.42	0.1–26.9	0.96– 3.92
Others not listed			
Temperature of fusion			1150°–1500°C.

A. Robinson, W. O., Stem Koenig, L. A., and Miller, C. F., The relations of some rarer elements in soils and plants. U. S. Department of Agriculture, Bulletin No. 600, December 10, 1917.
B. Variations in composition of ash from 9 coals, Fieldner.
C. Variations in composition of ash from 4 coals, Carnot.

The ash of the coal not only lowers the percentage of combustible matter, but its transportation and disposal must be paid for, and if it is high in lime, iron, alkalies, or magnesia its fusing point will be low and it is likely to form clinkers and to obstruct the flow of air through the bed of coal if burned on a grate. Because of the difference in weight of the ash and the pure coal it is possible to separate fragments of coal high in ash from the purer coal by a number of processes, all using water, sand and water, air, or air and sand to separate the heavy from the light pieces.

Sulphur. Sulphur as a constituent of coal very materially affects its use and grade. The presence of sulphur in coal reduces its usefulness for making metallurgical coke, as the sulphur affects the quality of the iron made with coke. The sulphur, commonly combined with iron in pyrite or marcasite, also increases clinkering and corrodes boilers, and may lead to spontaneous combustion of coal in storage.

The sulphur is in part derived from sulphur in the plants from which the coal came. This is called organic sulphur, and exists especially in the protein of plants. The amount of such sulphur in the coal may run as high as 2 or 3 per cent. Usually more of the sulphur is in the form of inorganic sulphur, either as free sulphur, sulphides, or sulphates. It is particularly in the form of sulphides that sulphur is commonly seen in the coal as either pyrite (FeS_2, isometric) or marcasite (FeS_2, orthorhombic). These are the familiar "brasses" of the coal mines. Pyrite may appear as a solid parting, as crystals, balls, as irregular crevice fillings, or as nodules of various shapes, occasionally hollow. Pyrite occurs in the coal or in the roof shales immediately over the coal. These nodules are of all sizes up to 1 or 2 yards in diameter. Commonly they are smaller than one's fist. In some coals the pyrite is almost or quite micro-

scopic in size and scattered all through the coal. Gypsum or calcium sulphate or sulphates of iron, copper, and manganese may occur sparingly.

While it is probable that part of the sulphur is always organic in origin, and came from the original plants from which the coal was derived, it is probable that high-sulphur coals have received most of their sulphur by infiltration into the bed. It is a matter of common observation that, in beds of coal in part overlain by shale and in part by sandstone, sulphur usually runs higher in the coal under the sandstone than in the coal under the shales. Also, it has been noticed that sulphur is more abundant in coals overlain by marine deposits than in those overlain by fresh water deposits. This relation is illustrated in southern Illinois where the No. 5 coal is commonly overlain by black shale containing shells known to live in the open sea. Over part of southern Illinois a brown plant-bearing shale comes in between the coal and the black shale. That is the area of the so-called "low sulphur coals" in southern Illinois.

Nitrogen. Recent studies in England[1] have shown that nitrogen occurs in the coal in three forms. The first comes off as ammonia directly upon heating; the second is in compounds that decompose in the presence of hydrogen forming ammonia, and the third is in resistant compounds, the so-called carbon nitrides, that are unaffected by hydrogen but decompose by the use of steam with liberation of ammonia. Nitrogen appears to be an intrinsic part of most of the compounds of coal.

Substances obtained with solvents. The third method of studying the constitution of coal is by attacking it with solvents. Organic solvents have long been known to attack coal, dissolving out certain substances. Thus benzine will dissolve more or less of the resinous constituents. Pyridine, caustic alkalies, and alkaline hypochlorites are active agents with most coals, particularly the younger coals. Peat and woody lignite may be almost completely dissolved in these reagents. Dilute nitric acid acts on lignites, and nitric and sulphuric acid will break down the older and more resistant coals. Parr and Hadley[2] found it possible by the use of phenol to dissolve out nearly all of the coking properties of Illinois coals.

The results of this line of attack are yet somewhat indefinite. Clark[3] says: "The extractive matter thus obtained is unfortunately, not simple, but seems to contain a mixture of substances whose nature is yet to be determined."

Other minerals in coal. In addition to the organic constituents of coal and the sandy and clayey parts of the ash, other inorganic ma-

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[1]Cobb, John W. Nitrogenous Constituents of Coal: Am. Inst. of Min. and Met. Eng., Trans. Vol. LXXI, p. 211-214, 1925.

[2]Parr, S. W., and Hadley, H. F., The analysis of coal with phenol as a solvent. University of Illinois Bull. 10, Vol. XII.

[3]Clarke, Frank W., The data of geochemistry. U. S. Geological Survey Bull. 770, p. 782, 1924.

terials are found in small quantity. Pyrite (FeS_2) has already been mentioned as common in coal. The following minerals have been reported in coal: gold, silver, vanadium, uranium, radium, molybdenum, millerite, cinnabar, chalcopyrite, bornite, sphalerite, galena, malachite, chlorides of sodium, potassium, and magnesium.

Origin of Coal.

Derived from vegetal matter. There remains today little or no doubt that all coal is derived from vegetal matter. Remains of fish are found in some cannel coal, but not in such quantity as to be considered as a constituent of the coal. It is possible that in certain boghead coal fish may have played a larger part, but with these exceptions microscopic studies of coal reveal such an abundance of plant structures as to leave no doubt that plants have been the source of coal.

Swamps and bogs the principal source. For a long time after vegetal origin of coal was recognized discussion continued as to whether this vegetal matter accumulated in place in swamps or from masses of trees and other vegetation washed together. The latter was known as the fluviatile theory. For a time the two theories had about an equal number of followers. Today it is clearly recognized that most coal was derived from vegetation growing in swamps and bogs. Cannel and boghead coal, it is well recognized, were accumulated in open water, probably within or immediately adjoining the swamps in which non-cannel coal was being laid down.

Some of the evidence for the bog theory is: First, the presence under the coal in most places of a bed of clay that in many areas is penetrated by the vertical roots of plants. Second, in many coal fields tree stumps are found resting on the under clay and penetrating the coal bed; or tree stumps are found immediately overlying the coal bed and standing vertically. Under the center of such tree stumps on top of the coal is often a cone of sandstone called a "pot," that is likely to drop after the coal has been mined from under it and thus become a source of danger. Third, the under clay is commonly much lower in content of fluxing compounds than the adjoining rocks, and this is believed to be due to the absorption of these compounds by the roots of the plants and their being carried upward into the coal bed. This is particularly noticeable where the rock under the coal bed is sandstone. Such a sandstone is often found to be penetrated by the roots of the plants from the coal bed and to be leached of the fluxing materials so as to make it white or gray in contrast with the rest of the sandstone which may be red or brown. Such a sandstone, as well as the normal under clay, is highly refractory, and is often used as fire clay or ganister for making

fire brick. Fourth, the microscopic study of coal has revealed such a normal association of stems, bark, spores, and other material, as to make it difficult to imagine they could be brought together except through the growth of the plants in place. The writer has seen lignite in the West that in single pieces appears to be so completely composed of large pieces of wood as to suggest water transportation and accumulation. When, however, the extent of such a bed is considered, and its fairly uniform thickness, it becomes difficult to imagine conditions under which such a bed could be laid down by having its material floated into place by water.

It may therefore be accepted that most non-canneloid coals originated from vegetation growing in place in vast swamps. Some idea of the extent of these swamps may be gleaned when it is realized that single beds of coal have been traced across three or four States. Some of these beds must have originally covered a score or more thousands of square miles. It may be accepted that these swamps lay close to sea level or to the level of large bodies of fresh or brackish water. In the lower part of the coal measures of Pennsylvania nearly up to the Pittsburgh coal between the beds of coal are beds of limestone and shale containing remains of marine life. In places these limestones and shales lie just below or above the coal beds and so nearly parallel as to leave little question that slight uplift over a broad area had lifted the ground out of the sea and made possible the swamps in which the coal accumulated or had sunk the swamps under the sea and made possible the laying down of the limestones and shales.

In the upper part of the coal measures of Pennsylvania are abundant limestones, but these contain no salt water forms but fresh or brackish water forms and therefore indicate the near presence of large bodies of fresh or brackish water.

Cannel coal. It has long been recognized that cannel coal must have accumulated under different conditions from non-cannel coals. More than 70 years ago Newberry[1] pointed out that cannel coal has the nature of water-laid deposits. According to White and Thiessen[2] the microscopic study of cannel coal shows that it includes fern spores, water weeds, algae, and other material that naturally accumulated in the open water of swamps. The remains of certain water animals, fish, mollusks, amphibians, and crustaceans, are in places associated in abundance with cannel coal. Finally, in many places cannel coal grades over into bituminous shale or ordinary shale. In a cut on the Indiana Southern Railroad near Burn City, Daviess County, Indiana, a bed of cannel coal a foot or two thick grades upward into coal which is similar in appearance, but which,

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[1] Newberry, J. S., On the mode of formation of cannel coal: American Journal of Science, 2d series, vol. 23, p. 212, 1857.

[2] White, David, and Thiessen, Reinhardt, The Origin of Coal: U. S. Bureau of Mines Bull. 38, 1913.

on burning leaves about half its original bulk as ash, and still higher into material which, though it resembles cannel, is reported by those who have tested it in a stove to leave a volume of ash greater than that of the coal put in. Above that bed the black color gradually turns to gray, and at the top there is only an ordinary gray clay shale. In some areas cannel coal grades into shale horizontally.

The close relation of cannel to shale is also seen in the high ash content of many cannels, due to the washing in of mud during the formation of the coal. Mud washed into an open water basin tends to accumulate most abundantly at the point of entrance, and cannel forming in such a basin may be quite free of ash in one part and be high in ash in another part.

Cannel coal differs also from other kinds in that it is not underlain, like bituminous coal, by a bed of clay containing the roots of plants, but in many if not in most places rests on rocks other than clay.

Again, although bituminous coal shows distinct banding, supposed to be due to changing surface conditions in the coal marsh, cannel coal is homogeneous, as if the conditions remained constant during the whole period of its deposition.

Furthermore, cannel coal almost invariably occurs in basins of very limited extent, often for a width of only a few hundred feet, though in length a basin is sometimes two or more miles, as though it represented a channel of open water.

Splint coal. The writer does not know of specific studies of splint coal but from such knowledge as we have of the nature of other coals it would seem logical to assume that splint coal is coal in which the process of decomposition by bacteria had progressed so far as to break down all large masses of woody material so that the whole is of the nature of attritus or dull coal. It is possible that a careful study of splint coal will show a different type of vegetal growth from that found in other coals. Some splint coals present a uniformly dull fracture when broken across the bedding; others, such as the Brazil block coal, present alternating very thin bands of bright and dull coal. On splitting the coal along one of the dull bands a surface of mineral charcoal is found. It is believed that these coals do not coke because the coking elements in the bright bands occur in such thin layers and so completely separated from each other as to prevent their running together and forming coke.

The origin of these mineral charcoal bands has long been a matter of discussion, some holding that they are the result of numerous fires, and that the apparently charred surfaces are such in fact; others, noting the amount of volatile matter contained in these bands and realizing the difficulty of accounting for the number of fires that

must have occurred have looked for some other explanation. In the block coal of Indiana which covers a thousand or more square miles, the layers of dull and bright coal alternating many times in a thickness of the bed, make it necessary to assume hundreds of fires at remarkably uniform periods of time and extending from one basin to another, for this block coal occurs in hundreds of basins, each, as a rule, of very limited extent. In opposition to the fire theory it has been proposed by David White and the writer that these charcoal layers are the result of a temporary drying up of the surface of a swamp preventing the continued action of bacteria, which depend upon moisture.

Early stages of coal formation. The first stage in the formation of coal is the accumulation of thick deposits of vegetal matter. The writer[1] some years ago made a careful study of the depth of peat or other vegetation required to produce one foot of coal, and of the least time during which that volume of vegetation could accumulate. It was concluded that one foot of surface peat would, at a depth of 20 feet, be reduced to 3 inches merely through loss of moisture. There would be further loss through partial decomposition, and it must be noted that the specific gravity of such deep buried peat is about double that of the original matter. Therefore, it was estimated that one foot of peat was reduced to 1⅛ inches when deeply buried. Fuller knowledge of the constitution of coal would allow a recomputation of the loss due to decomposition, which, the writer believes, would likely show an increase. The figure given was based on Bischoff's[2] studies of the chemistry of coal. According to Bischoff, a cubic foot of deep peat weighing 50 pounds, of which 15 to 20 pounds is water, will lose one-third of its weight through the loss of water and one-third of the remainder through the loss of organic matter, leaving 22 pounds as the weight of coal equivalent to one cubic foot of deeply buried peat. Hence, a cubic foot of Pennsylvania bituminous coal weighing 87½ pounds would represent about 4 cubic feet of well compressed peat. A bed of coal 9 feet thick, such as the Pittsburgh bed, would therefore present about 36 feet of well compacted, deeply buried old peat. The great beds of the anthracite region, 40 or 50 feet thick, would have required five times that volume, or 180 feet of such peat.

In the paper referred to, the writer reported the result of inquiry into the rate of deposition of peat or other vegetal deposits. Careful studies of the rate of accumulation of peat in Europe, and the rate of growth of fast-growing vegetation in the tropics, of alfalfa, and other fast-growing crops all indicate that under present day conditions not less than 300 or 400 years would be required to accumu-

[1]Ashley, G. H., The maximum rate of deposition of coal: Economic Geology, Vol. 2, pp. 34-47, 1907.
[2]Bischoff, Gustav, Elements of chemical and physical geology, Vol. 1, page 276, 1854.

late material enough for a foot of Pennsylvania coal. The actual rate may have been many times as slow, but is not likely to have been faster unless conditions for growth of vegetation were more favorable then than now. We have no clear evidence of such more favorable conditions. We may therefore estimate that the Pittsburgh bed, where 9 feet thick, would have accumulated in not less than 2,700 years, and it may have taken 10,000 years. The Mammoth bed of the anthracite region on the same basis may have required 15,000 years or more for its accumulation.

The decomposition of peat. Vegetal deposits are subject to decomposition by bacteria as fast as accumulated, or, if out of water, by fungus. Such action will continue until stopped by the complete destruction of the material acted on, or in earlier stages by exhaution of necessary oxygen, or the development of toxins that destroy the bacteria. The process may be stopped before it has gone far, leaving material still showing clearly the woody structure of the original plant, or it may progress until all structure has disappeared and the material has become amorphous. Coals are found showing all degrees of decomposition.

Transformation of peat into anthracite. Although questioned in some quarters it is generally recognized today that the principal element in the transformation of peat into anthracite has been pressure, both horizontal and vertical, accompanied with heat acting over a long period of time. Under such pressure and heat a kind of metamorphism or distillation has taken place such as takes place in the retort of a gas plant. If the process in a gas plant be stopped at various stages a series of products would be obtained resembling, in some measure, the various classes of coal between peat and graphite, which is the final stage of the process. The result of the distillation is expressed, first, in driving out moisture, and then volatile matter, leaving an ever-increasing ratio of free carbon, or fixed carbon as it is called, and ash.

The weight of the overlying beds tends to compress the peat and to force out moisture, and if the bed of peat is depressed for a long distance, owing to the sinking of the earth's crust and the accumulation of other sediments on top, there may be a perceptible rise of temperature in the peat bed that aids in driving off moisture and possibly will drive off some of the gas.

Pressure along horizontal planes is likely to crumple weaker beds and to cause slipping of one bed over another with subsequent rise of temperature due to friction. There are also likely to be introduced pressure cracks or joints which facilitate the escape of the gas from the coal. Such horizontal pressure is likely to produce jointing in the overlying rocks, as well as in the coal, which still further facilitates the escape of volatile matter. Where the hori-

zontal pressure is not great the joints in the coal are far apart; where the pressure is greater the joints are more closely spaced, as in the Pittsburgh district. If the horizontal pressure be still greater, as in the Allegheny Mountain region of Pennsylvania, the minute particles of coaly matter are forced to turn vertically, or at right angles to the pressure, so that the coal splits readily in vertical planes. The coal of Clearfield, Cambria, and Somerset counties is so completely broken up by close vertical joints that a larger proportion of small coal is produced by mining than in the Pittsburgh district. It is difficult to mine the coal without its breaking down into minute fragments.

It is not possible to say whether the increasing loss of moisture and volatile matter with increased jointing is due to the greater opportunities of escape provided by the more abundant jointing, or is due to the greater heat produced in connection with the partial collapse of the rocks under pressure. Probably both have acted together.

The process of transformation may be traced somewhat as follows: from peat to lignite the loss of volatiles (moisture and volatile matter) will involve a reduction from about 70 per cent of those substances to 65 per cent, with an increase in the percentage of fixed carbon from 20 or 22 per cent to 28 or 30 per cent. Studied more closely it is found that this reduction has been almost or entirely a loss of moisture, as shown in Fig. 1. At the same time the mass becomes firmer and can be broken into blocks rather than

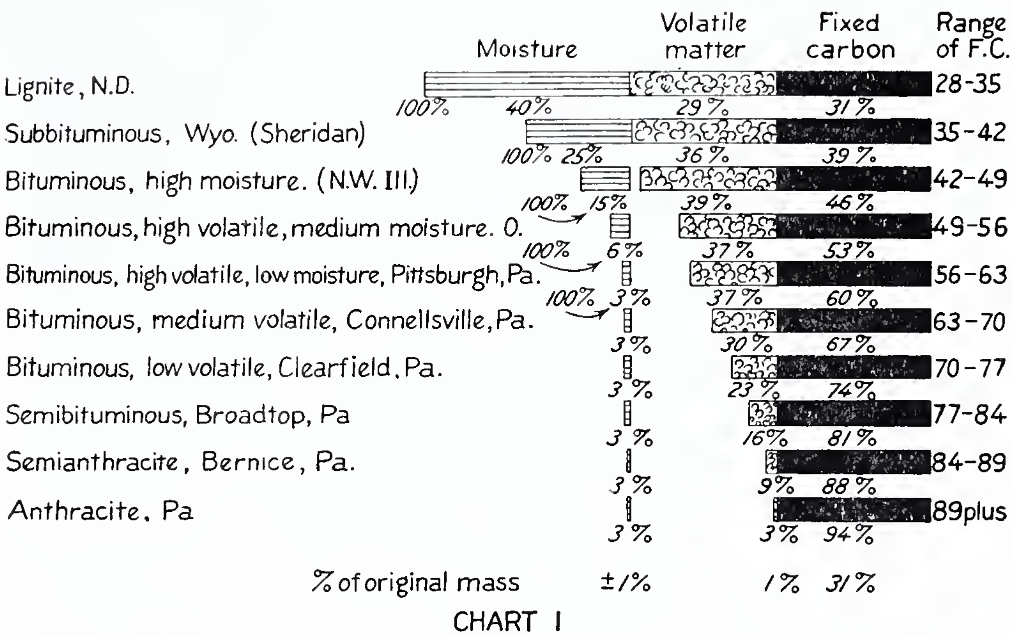

Fig. 1. Diagram showing proportionate loss of moisture and volatile matter on the assumption that the process is purely one of devolatilization with the amount of fixed carbon remaining constant.

cut with a spade. The woody or fibrous structure becomes more obscure and disappears to the eye. From lignite to subbituminous coal there is again a decrease in the percentage of volatiles of, on the average, about 7 per cent, and a corresponding increase in the percentage of fixed carbon. Again this change appears to be almost or quite all due to loss of moisture, as the ratio of volatile matter and fixed carbon in subbituminous coal is practically the same as in lignite. It is for just such reasons as this that many systems of classification for separating these coals break down. It should be understood that actually in nature there are no distinct classes of coal separated from each other by distinct gaps, but each class grades into the class above or below. The changes here noted are from the middle of one class to the middle of the next. The lines between classes will be noted under the heading Classification of Coals. The continued loss of moisture and volatile matter in the several ranks is best shown by Figure 1.

In subbituminous coal, such as at Sheridan, Wyoming, and in low rank bituminous coals such as those of northwestern Illinois, northeastern Missouri, and Iowa, there is a continued large loss of moisture and an appreciable loss of volatile matter. The ultimate analyses show a corresponding loss of oxygen with a slight decline in the percentage of hydrogen. The percentage of fixed carbon rises from less than 40 to about 46 per cent, the volatile matter rises from 36 to 39 per cent, and the moisture declines from about 25 to 15 per cent.

The figure shows, without prolonged description, a steady loss in the total amount of both moisture and volatile, though at first the loss of volatile matter is so slight as not to disturb the proportion of the whole. In the high rank coals the loss of moisture is persistent but so small as to leave the proportion of the whole undisturbed.

In anthracite the moisture and volatile matter, though 3 per cent of the whole, is only 1 per cent of the original mass, for anthracite represents only one-third of the mass of lignite with which the process started. As a matter of fact, the volatile matter is a derived substance and not an original substance that had existed in the coal, so it is not possible to say that the effect of the heat used for determining the volatile matter may not have quite different distilling effects on lignite from those on anthracite, and that the relations shown in the figure are only apparent. The changes revealed by ultimate analysis were shown under that heading.

Classification of Coals.

The business of buying and selling coal requires the naming of different kinds unless coal be sold by sample. But while coals form a natural unbroken series from one kind to any other kind, in order

to name them it is necessary to divide the series into parts or classes and to define the limits of each class. Many systems have been devised, nearly all of which use the ultimate analysis of the coal and some ratio of two elements of such an analysis. In general, most of those systems have sought a scheme by which all coals would fall into a single line or curve, or into a succession of blocks. Unfortunately for any such scheme coals differ physically as well as chemically, and some of these physical differences, which have a very important bearing on the use and value of the coal, are not reflected in the chemical analysis. The writer believes, therefore, that no classification based purely on chemical data will serve the purpose.

In the early days of the Great War the pooling of coal became necessary. Each pool supposedly contained coal of a single class and of a single grade. Some of the pools were distinguished by the sizes of the coal. At the time no satisfactory practical classification was in general use. The writer at once began a study of coals with special reference to their practical classification for pooling and other purposes. It is desirable or necessary to have definite designations for definitely defined classes of coals, so that any user of coal who might need to change his source of supply could specify in a word or two exactly the qualifications of the coal he needed. This investigation has been in progress since that time. Several preliminary papers with charts have been prepared[1] and submitted to engineers and coal men for study and criticism. As a result of these criticisms and subsequent studies new proposals were made and again subjected to study and suggestion by engineers and coal men. Finally, in 1923, the Coal Mining Institute of America appointed a committee consisting of men representing different phases of the coal industry—coal operators, salesmen, engineers, etc.—to consider coal classification. This committee held two meetings in Pittsburgh with the writer. As a result the committee gave its approval to the following scheme and recommended it to the Coal Mining Institute of America. The report of the committee was accepted by the Institute.

In 1924 the Institute voted to sponsor this classification before the American Society of Engineering Standards. In the fall of 1926 the classification was being actively studied and discussed by representatives of various phases of the coal industry under the general direction of the Society. In the meantime the writer's scheme is presented here, subject to revision or replacement when the study now being made is completed. It is not simpler than the plan presented by Persifor Frazer, Jr. in 1874 in which he proposed or used

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[1]Ashley, G. H., A new classification of coal. Trans. Amer. Inst. Min. and Met. Eng., 1919, pp. 1129-1141. 1920.

A practical classification of coals. Proceedings Coal Mining Institute of America, 1923, pp. 29-40, 1924.

what he called the "fuel ratio," that is, the ratio of volatile matter to fixed carbon. Unfortunately the Frazer plan, while serving excellently for the coals of Pennsylvania, fails entirely to distinguish the lower rank coals, including nearly all coals in the United States west of Pittsburgh.

In the scheme here presented account has been taken not only of scientific classifications, such as those of Parr[1], Seyler[2] and others, as well as of many earlier schemes, but in particular attention has been paid to such separation into classes as is implied in the pools adopted by the Tide Water associations, and in daily and weekly quotations of coal prices in the markets of the eastern United States. See paper referred to in the Coal Mining Institute of America.

For practical purposes coal may be divided into three types based on differences of origin, ten ranks or classes based on the stages of transformation from lignite to anthracite, and many grades, as described beyond. The term "rank" is used by the United States Geological Survey in a technical sense with the same meaning as "class" commonly used by engineers and producers.

Types of coal. In the middle ranks the three types of coal are readily distinguished as (1) caking coal, (2) noncaking coal, and (3) cannel coal. Cannel coal may be distinguished from the other coals in all ranks by its physical features, by its nonlaminated structure, conchoidal fracture, and satiny luster. In the lowest and highest ranks none of the coals cake, so that although the caking quality may have been inherent in those ranks it is difficult to distinguish coals of the caking type from those of the noncaking type. It is probable that coal of the noncaking type will ultimately be distinguished from caking coal in all ranks, either by the microscope or by the use of solvents. Such distinction, however, would be of little practical value for coals of highest and lowest rank. In the bituminous ranks of coal, however, the caking or noncaking property of the coal is of very large value in making coke, in by-product treatment, and in other uses. As most bituminous coals cake, whether they make good metallurgical coke or not, the classification by ranks is based on coal of that type. Noncaking and canneloid coals are distinguished in naming by adding the word noncaking or cannel, or the letter X for noncaking coal and K for cannel or canneloid coal.

Rank or class of coal. In the tables in the chapter on Chemical Character of Coal, the coals listed are illustrative of the several ranks adopted in this classification. It remains to define the limits of each class, and give each class a name. In the daily or weekly quotations of bituminous coal in the eastern markets, coals are quoted as "low

[1]Parr, S. W., Classification of coal. Jour. Indus. and Eng. Chemistry, Vol. 14, No. 10, p. 919, October, 1922.
[2]Seyler, Clarence A., in various British publications.

volatile," "medium volatile," and "high volatile." In defining the coals by pools in war time a medium volatile coal was defined as having 24 to 31 per cent volatile matter, a low volatile as having less than 24 per cent of volatile matter, and a high volatile coal as one having more than 31 per cent of volatile matter. As no standard of ash was specified, these boundaries were somewhat indefinite, but at least they served as a starting point. Assuming an average percentage of ash it is possible to recompute an analysis of coal to an ashless basis. Taking account of the actual coals listed in the pools as "medium volatile," the corresponding lower and upper limits in ash-free coal of that class became 27 and 33 per cent volatile. This coal should have from 63 to 70 per cent of fixed carbon. In the classification here presented this coal has been called midvol (medium volatile) coal. It includes coals having 63 to 70 per cent fixed carbon on the "as received," but ashless basis. This corresponds with typical coking coal such as that in the Connellsville basin, having a fuel ratio from 1.85 to 2.60.

The next highest rank, called in the market report "low volatile coal," is defined as coal having from 70 to 77 per cent fixed carbon on the ash-free basis. It has been called lovol coal. In these high rank coals the moisture is standardized at 3 per cent. Because in practice, especially for navy use, the low volatile coals are divided into two classes depending on the percentage of volatile matter, they are here divided into two classes, called lovol coal and loervol coal. Lovol coal has from 70 to 77 per cent fixed carbon and 20 to 27 per cent volatile matter (ash free). Loervol coal has from 77 to 84 per cent fixed carbon and 13 to 20 per cent volatile matter. The first covers the higher volatile smokeless coals such as that of Clearfield and northern Cambria counties; the second covers the low volatile smokeless coals, including only a relatively small number of coals in this country, typically Coal Hill of Arkansas, but including coals around Johnstown, Broad Top, Windber, and elsewhere in Pennsylvania, and the coals around Welch, West Virginia, and in other parts of that State. This coal corresponds to Admiralty coal of England, in great demand for navy use, and to the "Carbonaceous" coal of Seyler. By some writers all low volatile coals are included in the term semibituminous coal. Loervol coal has a fuel ratio from 3.85 to 6.5.

Anthracite is commonly divided into two classes distinguished as hard and soft anthracite, or as anthracite and semianthracite. Semianthracite has from 84 to 89 per cent fixed carbon and from 8 to 13 per cent volatile matter (ash free), and anthracite, over 89 per cent fixed carbon and less than 8 per cent volatile matter. The fuel ratio of semianthracite lies between 6.5 and 11, and of anthracite above 11.

The high volatile coals, because of the very large range of moisture and the corresponding large range of inert matter in them, both of which affect seriously the heat value of the coal, are divided into three classes, designated as hivol coal, hiervol coal, and moistvol coal. Hivol coal is typical Pittsburgh coal of the Pittsburgh region. It has from 56 to 63 per cent fixed carbon and 33 to 41 per cent volatile matter (ash free). Hiervol coal has from 49 to 56 per cent fixed carbon, and from 44 to 51 per cent of moisture and volatile matter. Moisture runs higher in hiervol coal than in hivol coal. Moistvol coal has from 42 to 49 per cent fixed carbon, and from 51 to 58 per cent volatile matter and moisture. Of this the moisture is likely to run from 12 to 18 per cent.

Next below the bituminous are the subbituminous coals. Here two classes are recognized, moistvol Z coal (Z standing for subbituminous), and himoist coal. Moistvol Z coal has from 42 to 49 per cent fixed carbon, and himoist coal from 35 to 42 per cent fixed carbon. Moistvol Z coal differs from moistvol coal both chemically and physically. The chemical difference shows in the ultimate analysis in the larger ratio of oxygen in the first, and the physical difference shows principally in the fact than when moistvol Z coal is heated rapidly it explodes and the draft blows it out of the chimney or smokestack. Coals of this class are mined extensively at Gallup, New Mexico, and Hanna, Wyoming.

Lignite is coal having under 35 per cent fixed carbon on the ash-free basis. This classification is shown in compact form in the following table.

Proposed Classification of Coal by rank.

(Based on "As received" ash-free analysis)

Groups	Suggested short names (classes)	Suggested code names	Range of fixed carbon in per cent	Average analysis (ash free)			Fuel ratios
				Moisture	Volatile matter	Fixed carbon	
Anthracite	Anthracite	Coal 89+	89+	3	3	94	11+
	Semianthracite	Coals 84-89	84-89	3	9	88	6.5-11
Bituminous coal	Semibituminous						
	Loervol coal	Coals 77-83	77-84	3	16	81	3.85-6.5
	Lovol coal	Coals 70-76	70-77	3	23	74	2.60-3.85
	Bituminous						
	Midvol coal	Coals 63-69	63-70	3	30	67	1.85-2.60
	Hivol coal	Coals 56-62	56-63	3	37	60	about 1.35
	Hiervol coal	Coals 49-55	49-56	6	37	53	about 1.30
	Moistvol coal	Coals 42-48	42-49	15	39	46	about 1.20
	Subbituminous						
	Moistvol Z coal	Coals 42Z-48Z	42-49	15	39	46	about 1.20
	Himoist coal	Coals 35Z-41Z	35-42	25	36	39	about 1.10
Lignite	Lignite	Coal 28L±	under 35	40	29	31	under 1.10

It is proposed that each coal in a class take its name from the percentage of fixed carbon it contains (ash-free basis). Thus a coal having 76 per cent fixed carbon is called Coal 76, in the class lovol coals.

Grades of coal. By the grade of a coal is commonly meant the percentage of ash. It is proposed that where ash alone is involved the letters A, B, C, D, be added to the code name to express four grades, for which the following limits are proposed: A (superior or excellent), below 8 per cent ash; B (good), 8 to 12 per cent ash; C (fair), 12 to 16 per cent ash; D (poor), above 16 per cent ash. Thus Coal 63-A is a medium volatile bituminous coal having less than 8 per cent ash; Coal 42-C is a high moisture bituminous coal carrying between 12 and 16 per cent ash.

In most transactions involving coal, the ash is the only element considered in grading. For some uses, however, it is desirable or necessary to consider either or both the percentages of sulphur and the fusing point of the ash. To cover these in the code it is proposed to use a second and third set of letters, F, G, H, I, to designate superior, good, fair, and poor quality in the coal as regards fusion of ash, and S, T, U, V to express four grades as regards sulphur content as defined beyond. Thus Coal 63 is a medium volatile (or midvol) coal, of any grade. Coal 63-B is the same coal with the limits of ash designated. Coal 63-BS is the same coal with the sulphur and ash classified. Coal 63-BFS defines the fusing point of the ash and the content of ash and sulphur. The following table gives the minimum and maximum limits for each letter in each grade:

Designation of Coals for Grade

Ash: less than 8 per cent	Designation	A:	grade:	Superior
" 8 to 12 per cent	"	B:	"	Good
" 12 to 16 per cent	"	C:	"	Fair
" 16 per cent or more	"	D:	"	Poor
Sulphur: less than 1 per cent	"	S:	"	Superior
" 1 to 1½ per cent	"	T:	"	Good
" 1½ to 5 per cent	"	U:	"	Fair
" 5 per cent or more	"	V:	"	Poor
Fusing temperature:				
over 2600° F.	"	F:	"	Superior
" 2600° to 2200° F.	"	G:	"	Good
" 2200° to 2000° F.	"	H:	"	Fair
" under 2000° F.	"	I:	"	Poor

Grading anthracite. The grading of anthracite is a subject by itself. Grading has usually been on the basis of the percentage of slate and bone observable to the eye. In practice, 100 pounds of

coal are taken from a car, drawing from not less than three places in the car, spread out and the slate and bone separated and weighed. During the war, the Fuel Administration set the following limits on anthracite of different sizes:

Percentage of impurities allowed in anthracite during war time.

	Slate	Bone	Total
Broken	1	2	3
Egg	2	2	4
Stove	4	3	7
Nut	7	5	12
Pea	8	10	18
No. 1 buckwheat	10	10	20

After studying a large number of car inspection tests the writer proposes the following limits for grading anthracite according to visible slate and bone contained. Secretary Walsh of the Pennsylvania Department of Mines, has cooperated in this study:

Grading anthracite by limits of slate and bone.
(In per cent, or in pounds in 100 pounds of coal.)

	Grade A (Superior)	Grade B (Good)	Grade C (Fair)	Grade D (Poor or bad)
Broken	Less than 2	2 - 3	3 - 4	4 or more
Egg	" " 2	2 - 4	4 - 5	5 " "
Stove	" " 3	3 - 5	5 - 7	7 " "
Nut	" " 4	4 - 7	7 - 10	10 " "
Pea	" " 5	5 - 8	8 - 12	12 " "
No. 1 buckwheat	" " 6	6 - 10	10 - 15	15 " "

It must be remembered that the slate and bone are in addition to the ash in the coal itself. On the other hand, the bone coal may have as high as 70 per cent of coal. It must also be remembered that in the alteration from bituminous coal to anthracite the ash increases in the same ratio as the fixed carbon, or possibly at a somewhat higher rate. A bituminous coal having 56 per cent fixed carbon and 8 per cent ash, if altered to an anthracite having 84 per cent fixed carbon, should have 12 per cent ash. It is, therefore, hardly fair to expect anthracite to be graded on the same low percentage of ash as is bituminous coal.

Considering the cost of cleaning and sizing anthracite and that steam size may sell at the mine at one-fourth the cost of mining and preparing, it is not to be expected that the steam sizes will be cleaned with the same care as household sizes at present low prices.

Code designation of cannel and other coals. The table of classes given in an earlier paragraph treats of the common type of caking bituminous coals and anthracites derived from that type, which may be taken as "standard" type coal. Letters may be added to the class

name to express other types of coal, as follows: K for canneloid coals or "semi-cannel coals" of any class; KK for cannel coals (coals in which the percentage of volatile matter exceeds the percentage of fixed carbon— or the fuel ratio is less than 1.); KKK for boghead coals (in which the fuel ratio is less than ½); KKKK for torbanite or oil shale.* Sp designates a splint coal; Z, a subbituminous coal; L, lignite. Thus Coal 63-KBSF is a canneloid, medium volatile coal having between 8 and 12 per cent ash, less than 1 per cent sulphur, and a fusing temperature of ash above 2600° F.

All coals can be classified by this plan as closely as 99 out of 100 users need, with very little expense for chemical analyses, since the "class" is determined by knowing the percentage of fixed carbon and ash alone.

Correction for ash. Analyses are commonly submitted on the as-received basis, including the ash. In order to classify the coal by the system here presented it is necessary to recalculate to the ash-free basis. The recalculation is made by dividing the percentage of fixed carbon, as given, by (100 less the amount of the ash). Thus a coal with 70 per cent fixed carbon and 6 per cent ash will have 74.4 per cent fixed carbon on its ash-free basis.

$$\frac{70}{100\text{-}6} \text{ or } 70 \div 94 = 74.4$$

As this calculation is not readily carried out in the head, a simpler method, though not strictly accurate, can be used as a preliminary test that in most instances will indicate the results accurately enough for most purposes and can be done in the head. Thus, a coal having 70 per cent fixed carbon and 6 per cent ash will contain ($70 \times 6 = 420$, point off two places and add, equals) 74.2 per cent fixed carbon on the ash-free basis.

Classes of Coal

It may be desirable in addition to the description given above to characterize briefly the various classes of coals as recognized by this classification.

Anthracite. Anthracite contains 84 per cent or more of fixed carbon on the ash-free basis. It does not soften or swell on burning; burns with a blue flame at first, or at most with only a faint yellow flame, which in all instances becomes transparent on attaining full combustion. It produces no visible smoke at any time.

Hard anthracite is typically hard, bright, with a subconchoidal fracture, resisting abrasion. As here distinguished it has not less than 89 per cent fixed carbon on the ash-free basis.

Soft anthracite or semianthracite is commonly a brittle tender

*For detailed description of cannel coal, see U. S. Geol. Survey, Bull. 659, Cannel coals in the United States.

coal, making a large percentage of fine sizes in mining, containing between 84 and 89 per cent fixed carbon on the ash-free basis, showing a slightly yellow flame when beginning to burn.

Bituminous coal. Bituminous coal in general is characterized by having sufficient carbon in the volatile matter to burn with a yellow flame, owing to the incandescence of the carbon. Some bituminous together into a mass or cake, hence called caking coals. Where this property results in producing a usuable coke the coal is called coking coal has the property when burned or heated of swelling and running coal. Other coals when burned, retain the original shape of the pieces until consumed, and are called noncaking coals. Some of these are bright and burn with a cherry red glow, hence have been called cherry coals. Others are a dull gray and are called splint coals. Still others consist of thin alternating bands of dull and bright coal that split easily along the dull bands, revealing charcoal or mother of coal (fusain) but break across the bands with difficulty. Such coals commonly are cut by distinct vertical joint planes in the bed, hence mine in large blocks and are known as block coals. These coals may be very resistant to weathering or disintegregation.

Both caking and noncaking coals differ in the ratio of fixed carbon and volatile matter (including moisture). Nearly all of the high-carbon bituminous coals (coal 56 or above) are low in moisture, averaging about 3 per cent. In order to avoid difficulties of classification of coals above coal 56 due to slight differences of moisture, it is proposed that (if necessary for classification) this analysis be recalculated to 3 per cent moisture.

The several ranks adopted are as follows:

Locrvol coal or Coals 77-83. This is a very high-carbon coal rather rare in this country but abundant in Wales, where it has long been known as Admiralty coal from its large use by the British navy. The principal areas of this coal in the United States are in southern Cambria and northern Somerset counties, and Broad Top field, Pennsylvania; parts of McDonald, Mercer, and Raleigh counties, West Virginia; the Brushy Mountain field of Virginia; and in Johnson County, Arkansas. This coal, as known in this country, is very friable, owing to pressure and crushing having developed minute vertical joints that make it split readily in vertical planes into "sticks," often the full thickness of the bed. Most of this coal is sold run-of-mine. It has between 77 and 84 per cent fixed carbon and between 13 and 20 per cent volatile matter, on the ash-free basis. This coal may produce fairly black smoke immediately after firing, but ordinarily it quickly clears and fairly justifies the name "Smokeless coal."

Lovol Coal or Coals 70-76. This class includes the rest of the low volatile or high carbon coals. This coal has between 70 and 77 per

cent fixed carbon and between 20 and 27 per cent volatile matter, on the ash-free basis. With 10 per cent ash such coal would lie between 63 and 69.3 per cent fixed carbon and 18 to 24.3 per cent volatile matter, in accord with the specifications for tidewater pools 9, 10, and 11. This coal closely resembles loervol coal physically. It is commonly classed as smokeless, though producing much more smoke than coal of the loervol class.

Into this class fall Clearfied and Somerset county coals and most of the coals in the counties northeast of Clearfield, including Centre, Clinton, Tioga, and Bradford. The coal of northern Cambria County also falls in this class, and a little coal where Indiana, Cambria, and Westmoreland counties join.

Midvol coal or Coals 63-69. This class includes the medium volatile coals of the Tidewater classification. On the ash-free basis this coal has from 63 to 70 per cent fixed carbon and 27 to 34 per cent volatile matter. With 10 per cent ash the fixed carbon would lie between 57.2 and 63.6 per cent and volatile matter between 24.3 and 30.6 per cent, including, in general, coals of pools 12 to 15. This corresponds to Connellsville coking coal in rank though not necessarily in quality.

Hivol coal or Coals 56-62. This class includes high volatile coals having low moisture, typified in particular by Pittsburgh coal of the Pittsburgh district. When ash-free the coal has from 56 to 62 per cent fixed carbon and 34 to 42 per cent volatile matter. With 10 per cent ash the limits are: fixed carbon 50.4 to 56.7 per cent; volatile matter 30.6 to 37.8 per cent. This coal is commonly firm, blocky, excellent for steam, a good coal to ship. It is a long flame, smoky coal unless burned in furnaces designed to properly burn long flame coal. It lends itself to use in the pulverized or powdered form.

Hiervol coal or Coals 49-55. West from Pittsburgh the percentage of moisture and volatile matter increases slightly. Coal of this class has from 45 to 51 per cent volatile matter. Commonly the volatile combustible matter and moisture increase together. The moisture ranges between 3 and 10 per cent. This coal shows a lower heat value, not alone because of increased moisture, but because of the inert matter or potential moisture in the so-called combustible matter.

Moistvol coal or Coals 42-48. This is the lowest class of truly bituminous coals and also includes the best of the subbituminous coals, such as those from the Gallup, New Mexico, and Hanna, Wyoming, fields. It includes many of the coals of Iowa, Missouri, Illinois, and Indiana, which on ordinary analysis show from 10 to 17 per cent moisture. On the ash-free basis it is defined as coals having between 42 and 48 per cent fixed carbon. This coal is obviously low

in heat value, the "inert volatile" showing an increase over that in the preceding class.

Himoist coal or Coals 35-41. This class includes typical subbituminous coal, such as that mined at Sheridan, Wyoming. Aside from its high percentage of moisture and low fixed carbon this coal is characterized by the readiness with which it breaks down, when exposed to the weather, into irregular shaped pieces. It occurs in thick beds in several Western States, particularly in Montana and Wyoming, and is used extensively there for railroad fuel.

Lignite or Coals 28-34. Lignite is distinguished physically by its woody, fibrous, or earthy structure, in contrast with the massive structure of all bituminous coals. Chemically it is characterized by having a greater percentage of moisture than of fixed carbon.

Lignite underlies large areas in North Dakota, South Dakota, Montana, and Texas. The beds in the Dakotas run as high as 30 feet thick and outcrop for many miles. It is mined for domestic purposes, steam-raising, and producer gas. It is known as brown color from its color, splits into shales when dry, and smells of sulphur when burned.

Graphite. The final result of intensive squeezing or pressure upon a coal bed is the complete removal of all the volatile matter and the changing of the coal into graphite. This actually occurs in the Rhode Island field where in parts of the area the coal bed has been entirely squeezed out of place and accumulated in thick bunches in other areas. Where the squeezing has been most intense the coal has been converted into graphite, so that within two miles of each other may be a coal mine and a graphite mine on the same bed.

Distribution of coal in Pennsylvania by classes. The isocarb map, page 165, shows very closely where coals of the several classes may be found in Pennsylvania. In general, coal in the area above the isocarb line 80 falls into the loerval class; that between isocarbs 72.5 and 80 into the lovol class; that between isocarbs 65 and 72.5 into the midvol class; that between 57.5 and 65 into the hivol class; and that below isocarb 57.5 in the hiervol class.

THE COAL BED

General

Normal occurrence in beds. Coal occurs in beds commonly less than 10 feet thick, but having a horizontal extent from a few acres to thousands of square miles. Locally coal, particularly cannel coal, occurs in pockets or basins of very limited horizontal extent. Indeed, certain cannel coal deposits in Missouri appear to have been laid down in sink holes in a submerged limestone so that their basins are kettle-shaped.

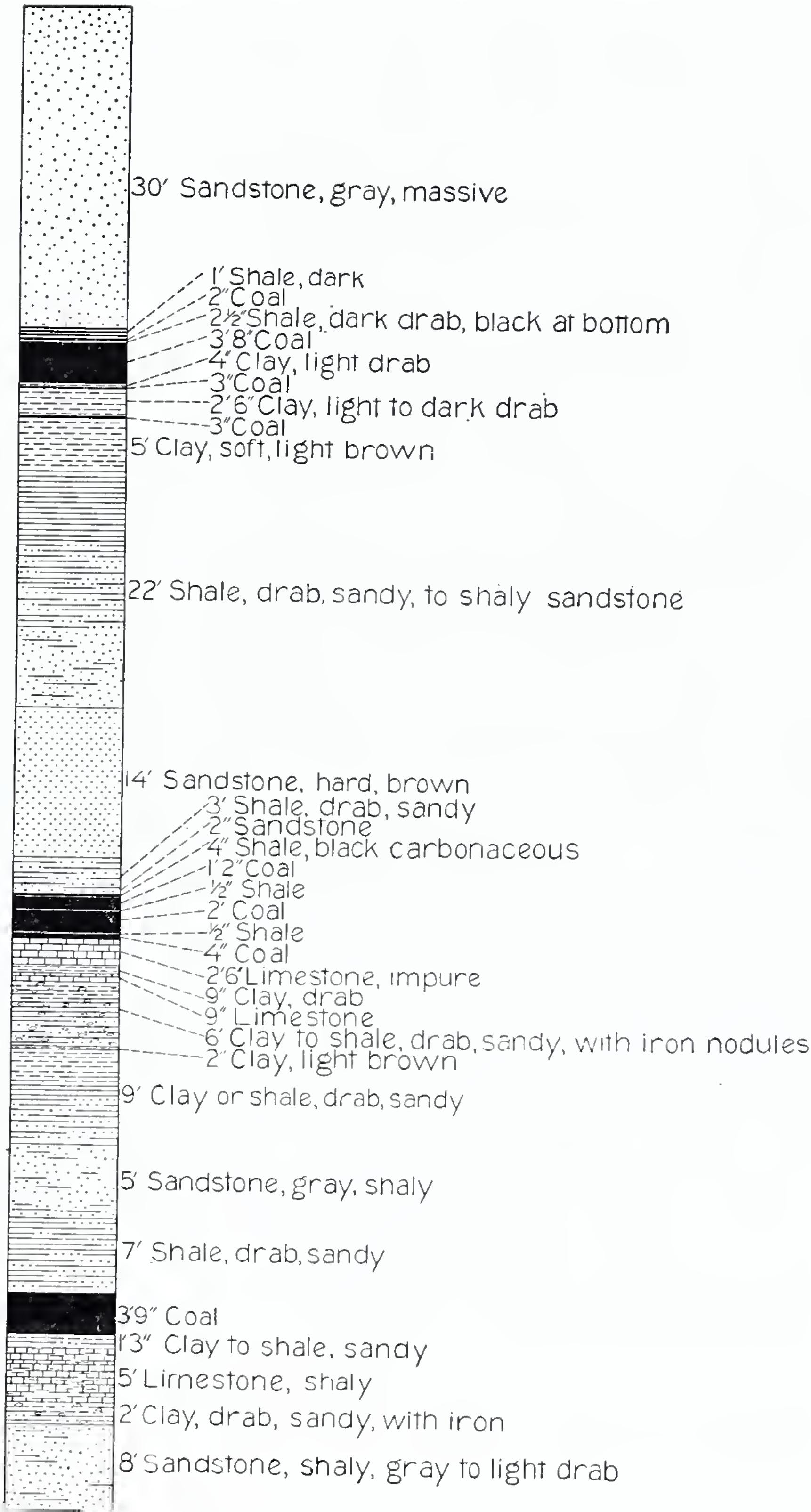


Fig. 2. Section of rocks typical of "Coal Measures."

Commonly more than one bed is found in any area, and the number may be as high as thirty, or more. The beds may lie practically parallel, only 5 to 10 feet apart, though more commonly they are more than 30 feet apart. Usually any 100 feet of the coal measures will be found to contain two or more coal beds, the number locally reaching five or six. The distance between any two beds may be very constant over large areas, or it may vary between wide limits within a few miles.

Some of the beds are uniform in thickness, others extremely variable; some consist of solid coal the full thickness of the bed, others consist of two or more benches separated by partings of many kinds which may range from a film up to several feet. The coal of the several benches may be identical in quality and character, but more commonly shows a difference either in character or grade.

Thickness of beds. Most of the coal beds of western Pennsylvania are less than 5 feet thick, and none of them average 10 feet, though several of the beds exceed 10 feet in thickness locally. The Pittsburgh has a thickness of 7 to 9 feet over much of its area. Several of the other beds reach 6 to 8 feet over limited areas. Nearly all of the beds reach locally a thickness of 5 or 6 feet. While the Pittsburgh bed in Pennsylvania may average over 6 feet thick, most of the other beds average under 3 feet, and many of them average hardly more than 18 inches.

The coal beds of the anthracite region average thicker than the beds in the bituminous region. Several of the anthracite beds are more than 20 feet thick, and an average of 30 feet over considerable areas is not uncommon. Still greater thickness occurs where the coal has been thickened by squeezing. What has been said about the thickness of the coal beds of western Pennsylvania applies equally well to the coal beds of all of the Appalachian region, the Eastern Interior region which includes Illinois, Indiana, and western Kentucky, and the Western Interior region which includes the States west of the Mississippi River and east of the Rocky Mountains. In the western Great Plains and the Rocky Mountain States the coal is commonly of lower rank than in the Eastern States, but this is in part compensated by the increased thickness of the beds. At one point in Wyoming a bed has a normal thickness of 84 feet. The coal beds of foreign countries do not differ greatly in thickness from those of western Pennsylvania, though at Chein-Chin-Chai, China is a bed of coal that locally has a thickness of 200 feet or more.

Extent of coal beds. Individual beds range from a few feet in horizontal extent to hundreds of miles. Here and there are found lenses of coal, particularly in sandstone, which may be 6 or 8 inches thick in the center and thin to a feather edge 10 or 20 feet either side of the center. Such lenses are commonly dish-shaped, owing to

greater shrinkage of the accumulated vegetation at the center of the lens. Cannel coal commonly occurs in narrow basins; the coal may be 5, 10, or 15 feet thick at the center and thin out at a few hundred feet on either side. Such a basin may have the form of a round lens, or may be lens shaped in cross section but have considerable extent lengthwise. Both at Cannelton, Beaver County, and at Bostonia, Armstrong County, cannel coal occurs in what appear to have been channels at least a mile or two long and less than 1000 feet wide.

Beds of bituminous coal, however, have more commonly the shape of blankets than of lenses, the thickness at the thickest point usually being far less than 1-100,000th of the diameter of the bed. There appears to be little relation between thickness and extent, some of the thinnest beds having the largest extent.

The original extent of most coal beds must be a matter of conjecture, as nearly all coal beds come to outcrop, which means that part of the bed has been carried away. In some instances it is evident that the portion of the bed remaining is only a small part of the original bed. Thus in Pennsylvania the Northern Anthracite Fields are only remnants which have been folded down below the level of an old erosion surface and thus preserved. The Broad Top coal field is another remnant preserved because folded down low enough to escape removal at the time when all the rocks above the mountain top were planed off. There is every reason to believe that originally the beds found in the anthracite fields and in the Broad Top field extended westward and connected with the coal beds in the main bituminous fields of western Pennsylvania.

The Pittsburgh bed today underlies more than 5,729 square miles, of which 2,077 square miles are in Pennsylvania. How much more it originally covered can only be guessed. The Tracy coal bed in the anthracite fields is thought from the fossils to occupy about the same position as the Pittsburgh bed. If this is really a part of the Pittsburgh bed then that bed may originally have covered most of Pennsylvania. Fragments of the Pittsburgh bed are certainly known at several points in eastern Somerset County, which are as far from the eastern edge of that bed in Fayette County as that edge is from the west line of the State. It is likely therefore that the bed originally covered not less than 5,000 or 6,000 square miles in Pennsylvania, and may have covered all together 20,000 or 30,000 square miles.

The underlying Freeport and Kittanning coals certainly occupy a much larger area today than does the Pittsburgh, and they may have occupied a much larger original area than they do now. The Lower Kittanning coal is thought to be traceable from Tioga and

Bradford counties in Pennsylvania, and possibly from Lackawanna County, through western Pennsylvania, Maryland, Virginia, Ohio, and West Virginia to northeastern Kentucky, a distance in a bee line of over 400 miles. It is characterized over the whole distance by an abnormally thick under clay, and in other ways. Some of the other beds, notably the Upper Freeport, seem to have been hardly less extensive though not so persistent.

In the southern Appalachians are some beds thought to have been traced from West Virginia to Tennessee. Some of the coal beds in the Illinois, Indiana, and western Kentucky coal fields likewise seem to be even more widespread and persistent. At least they are preserved today over larger areas than any in the Appalachian region. The No. 5 bed of Illinois and Indiana (and its equivalent, the No. 9 bed of Kentucky) is as thick or thicker than the Pittsburgh bed and maintains that thickness over an estimated area of tens of thousands of square miles.

None of these beds maintains a uniform thickness over the whole of the area which it underlies, and each is known to be absent from its horizon within part of the area. The Pittsburgh bed is remarkably uniform in Pennsylvania, but is lacking or thin at its horizon under large areas in West Virginia and Ohio.

Coal horizons. It is often possible to recognize the position of a coal bed in the section of rocks even though the coal bed itself is lacking. It is customary to speak of such a position as the "horizon" of the coal. The absence of the coal may be due to many causes, to be described beyond. It is generally true that the clay underlying any coal horizon is more persistent than the coal bed at that horizon, and this helps in recognizing where the coal belongs when it is absent.

The Bed Section

As stated, a coal bed may be a solid sheet of coal, but more often it is split up horizontally into two or more closely adjoining sheets or benches, which may differ in character and grade, and may be separated by partings or binders. This separating material is called a parting if it breaks free from the coal in mining, or a binder if it clings to the coal above and below.

Partings and binders. The material separating the benches may be clay, shale, sandstone, bone, or a bony coal, and very occasionally pyrite, limestone, iron ore, or other rock. Most partings consist of clay if thin, or shale if thick. In some coal beds the clay partings weather soft and white. On being exposed to the air, as in a mine, such partings may appear like white chalk marks. Sandstone partings are rare except where a bed splits and the parting becomes many feet thick. The origin of some of these thin but widespread

partings has not been satisfactorily explained. In the Pittsburgh bed and many other beds are found clay partings less than 1 inch thick that appear to be continuous and remarkably uniform over hundreds of square miles. Indeed, the Pittsburgh and other beds may show several such partings. The "blue band" coal of Illinois carries a parting of "soft dust to hard blue shale" and pyrite near the bottom. This has a thickness of from ½ inch to 4 inches, averaging less than 2 inches. It characterizes this coal over all of southern Illinois. The Fire Clay bed of Kentucky, equivalent to the Chilton bed of West Virginia, carries a parting that commonly contains streaks of flint clay. The bed is traced from West Virignia into northern Tennessee. How were these thin partings laid down? The possibility that they were wind blown volcanic ash at once suggests itself. The necessary studies to determine whether such an origin is possible have not yet been made. Considering the number of these partings in the several successive beds this origin seems unlikely. Another suggestion is that they are wind blown dust lifted by cyclones possibly at some distance from the coal-swamp area. A third suggestion is that the coal swamps sank and were flooded with water to a considerable depth, and while in this condition a large volume of mud was washed in that instead of settling at once to the bottom spread out over several hundred square miles and then gradually settled. Another study yet to be made is a comparison of the composition and character of these parting clays in the coal with the clay commonly found below the coal.

Partings of shale, resulting obviously from such washing in of mud, are frequent, but such partings in coal beds commonly thin rapidly from one direction and disappear within a few miles. These partings appear to be of a different nature from the thin uniform clay partings in the coal. The clay partings usually do not show steady thickening toward any point. It is difficult to understand how such a volume of mud could have washed in and spread out so evenly without showing a thickening toward some one point or in some direction.

Sandstone, limestone, pyrite, and iron ore partings suggest accumulation in water and lend strength to the theory that the clay partings will also be found to have been deposited from water.

The commonest binder in a coal bed is bony coal, that is, impure coal carrying more than 30 per cent ash. If the ash is above 50 or 60 per cent the mixture is called "bone." A bony coal or bone binder may be from a fraction of an inch to several feet thick.

The coal benches. The partings, even though only a fraction of an inch thick, do more than divide the coal into benches. They almost always mark changes in the conditions of the swamp, or in the surroundings, that result in changes in the character of the

benches above and below. It is frequently found that the bottom bench of coal is inferior because higher in ash, and that the top bench is inferior because it is higher in sulphur. It is perhaps more commonly true that the benches of coal in the middle of the bed are the best, and as a whole the thickest persistent bench is the purest.

In studying coal for coke making it has been noted that in part of the Pittsburgh field the sulphur is highest in the very top and bottom of the coal and curiously an increase in thickness of the bed results in no increase in thickness of the low sulphur coal, the increased thickness at the bottom or top of the coal being uniformly high in sulphur.

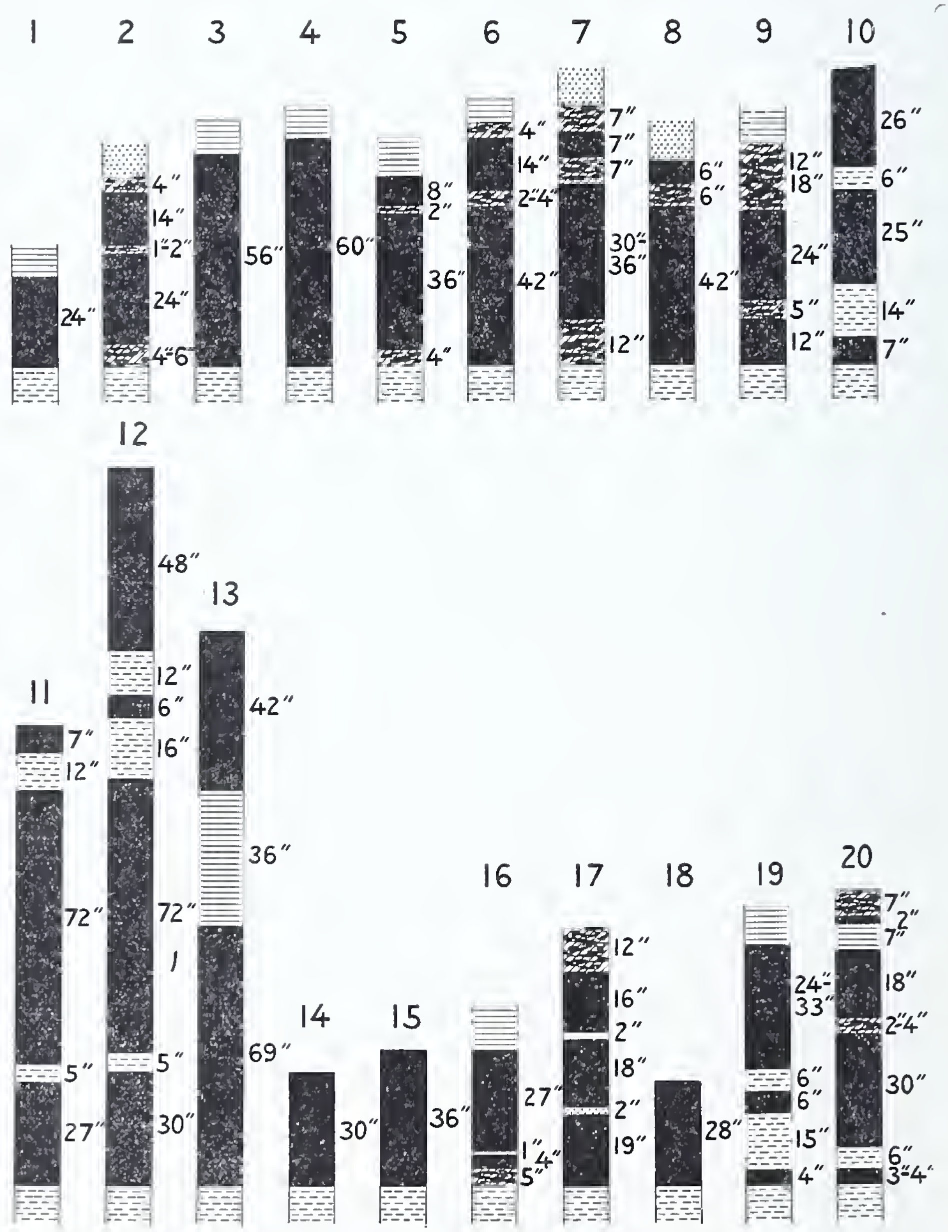


Fig. 3. Sections of the Lower Freeport coal in the Glen Campbell region of Indiana County to show variation in bed section over a small area.

Besides these differences in grade between the benches differences in the character of the coal are common. Frequently one bench is cannel and the others are bituminous, or one bench may be splint coal and the others are bituminous. In the Bernice field of Pennsylvania a bed is part semianthracite and part bituminous.

Figure 3 and the figures in Part II by J. D. Sisler show clearly that sections of the same coal bed may vary within a very small area. On the other hand, hundreds of sections of the Pittsburgh coal show remarkable uniformity of bed section. Characteristically this valuable bed consists of a bottom bench 12 to 20 inches, a parting thin or sometimes absent, the "brick" bench 12 inches thick, a parting ¼ inch, the "bearing-in" bench 4 to 6 inches, parting ¼ inch, the "breast" or "main" bench 2 to 10 feet, the main or over clay 12 inches, a roof division 2 to 8 feet.

Foreign materials in the bed. Aside from the ash which may be scattered all through the coal, and bands of clay or other parting rock, the coal frequently contains concretionary and other bodies called "coal balls," "coal apples," and "sulphur balls" ("hardheads" or "niggerheads"). Coal apples and balls consist mainly of calcium carbonate, magnesium carbonate, iron carbonate, and iron oxide, with some clay, shale, or sand. The sulphur balls consist of pyrite or marcasite (FeS_2) mixed with clay or sand. Some of the latter, when broken, show the bright, brass-yellow color, "fool's gold," characteristic of pyrite. More commonly they are heavy, but when broken show only a dull black or dark gray surface, sometimes with a suspicion of brassy sparkle. These pyrite or marcasite concretions may be small or large, abundant or widely scattered. Most commonly when present they are found in some definite position, as near the top of the bed of coal. Where the coal is overlain by marine shales there may be so many of these sulphur balls in the roof as to constitute nearly the entire roof material.

Where the concretionary material is calcareous, making "coal balls," it frequently contains pieces of plants often well preserved, and it is noted that these plants may be of different kinds from those found in the coal bed, suggesting that they were transported from a distance.

In a few places the coal contains stumps of trees that originally grew in the under clay of the coal and having died were in part buried by the accumulation of swamp matter.

The floor of the coal. The coal beds of Pennsylvania almost without exception lie on beds of clay. This is not universally true of all coal beds, and while some present day peat beds lie on clay, others do not. The coal in the block coal fields of Indiana occurs in basins of a few acres to a square mile or two. The smaller basins are distinctly saucer-shaped, and the bottom of the coal in the center

of the basin may be 20 or 30 feet lower than on the edge. The coal likewise consists of overlapping benches; the bottom bench is commonly confined to the center of the basin, the higher benches spread out over the edges of the benches below but thin out against the flanks of the basin. The top bench may pass from one basin over the divide into the next basin without losing in thickness. In these basins it may be noted that the coal in the center of the basin lies on clay, while that on the edges or on the divide is commonly on sandstone. Both the sandstone and clay show penetration by the roots of coal plants, and the sandstone commonly shows a distinct leaching effect as if acted upon by the roots of the plants constituting the coal.

The thickness of the under clay may vary without any relation to the thickness of the coal. In many areas under clays exist where no coal bed is known today. To my knowledge no attempt has been made to determine if under clay not overlain by coal and where coal does not appear to have been removed, is different from the clay under the coal.

It is a common occurrence for the under clay of coal to be underlain by a more or less massive sandstone. Such a sandstone resists weathering, and being overlain by clay, coal, and these in turn usually by shale, which yield readily to weathering, this combina- lain by a more or less massive sandstone. Such a sandstone resists tate tracing the coal beds.

The clay under the coal may be nearly white, but is commonly drab. It may be soft and plastic, or become soft when wet, or it may be firm and tough and hard to dig. Commonly it is not horizontally bedded but mines out in irregular lumps, often slickensided, showing that the clay has undergone considerable movement within the mass, produced either by horizontal or vertical pressure.

The lighter colored varieties in particular are commonly fairly refractory; at least they serve to mix with flint clay in making fire brick. Associated with these under clays in places and at several horizons are found irregular deposits of flint clay. This variety of clay rock is often highly refractory and is much used for making high-grade fire brick.

The succession of sandstone, clay, and coal is not as frequent in Pennsylvania as in some areas. Several of the coals in Pennsylvania are underlain at a short distance by limestone; the two Freeport and the Upper Kittanning coal beds are examples of this.

In some regions much trouble results from a tendency of the clay under the coal to soften when wet and to creep, filling entries and preventing mining the coal. Little trouble of this kind has been noted by the writer in Pennsylvania.

The roof of the coal. The roof of the coal may be any kind of

rock, but most commonly is shale. These shales often show an abundance of plant remains. Above the shales may be sandstone, limestone, or other rock. Commonly the shale has a thickness of 10 or 20 feet, or more. When undermined it may stand without falling, but more commonly the basal part of the shale (the "draw slate") tends to come down. The draw slate which comes down may be only a few inches thick, and the rest of the shale may stand up, or the shale may all tend to come down if not adequately supported by timber. In some areas the shale roof is overlain at a distance of a few feet by sandstone. Under these conditions the shale is likely to fall readily, leaving the sandstone as the roof.

Sandstone may make the roof under two conditions: First, the close coal-forming conditions may be followed by subsidence and that by in-wash of sandy material that afterward consolidates into sandstone. Such a sandstone roof may be regular and be associated with a normal thickness of coal. Second, the sinking of the coal bed is followed by an in-wash of mud, which forms the shale roof. This is followed by uplift and erosion which may locally remove part or all of the shale down to the coal, and may even remove part or all of the coal. This is followed by sinking and the in-wash of sand. The final result will be a bed of sandstone lying on an irregular erosion surface. In places the sandstone lies 20 to 30 feet above the coal, then the bottom of the sandstone descends sharply to or into the coal, forming the roof of the bed. Under these conditions the coal under the sandstone roof is usually thinner than normal and very irregular in thickness. Coal under such a roof is spoken of as faulty. If such a sandstone is laid down before the compacting of the coal bed is completed, or as is usually the case, the continued settling of the bed tends to throw an extra weight on the coal under the sandstone and to produce squeezing and disturbance within the coal. This in turn may allow the entrance of water carrying sulphates in solution, so that such coal may be not only thin but crushed and dirty.

In some parts of Pennsylvania the coal is very "faulty," owing to erosion during "coal measure" times. Uplift and erosion occurred many times while the coal beds were being laid down. The effect is particularly noticeable in cutting down or cutting out the Upper Freeport coal, and to less extent the Lower Freeport and Lower Kittanning coal. Such an erosion surface cutting into the Upper Freeport coal is well exposed in the cut along the Pennsylvania Railroad track between Freeport and New Kensington. In the Punxsutawney-Reynoldsville region both the Upper and Lower Freeport coals have been extensively removed owing to erosion which took place shortly after the laying down of the Upper Freeport bed. In

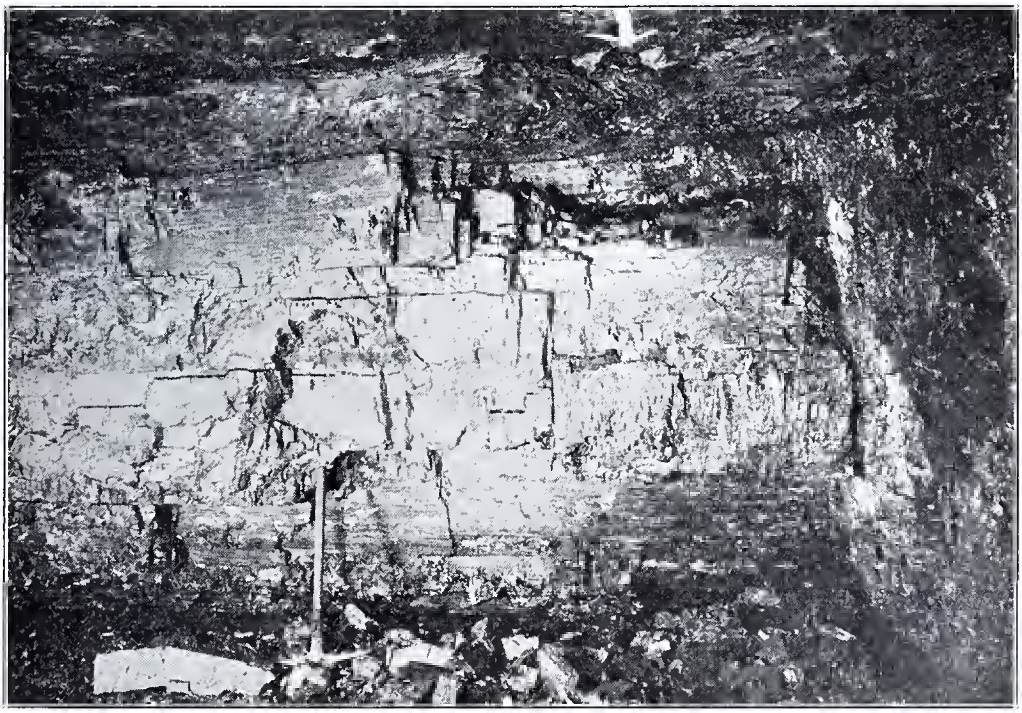
one area near Reynoldsville it is reported that drill holes several hundred feet apart in advance of a drainage tunnel showed apparently a normal coal bed. Later when the tunnel was dug it was found that soon after passing one of these drill holes the coal ran out into sandstone which continued almost to the next drill hole. Immediately after passing that drill hole which appeared to have entered a block of coal hardly larger than a room, sandstone was again encountered and continued nearly to the next drill hole.

A considerable area of the Lower Freeport coal is cut out east of Punxsutawney. Very similar conditions above the Lower Kittanning are found in many areas. Normally a dark shale appears to have been laid down on top of the Lower Kittanning coal, and on top of that a small coal. Still above that came a sandstone. The bottom of this sandstone is, however, quite irregular, and in a number of places has been seen by the writer descending sharply to the Lower Kittanning coal, cutting into that coal or cutting it out entirely. West of Bennington on the Pennsylvania Railroad the Homewood sandstone cuts out the Mercer group of rocks, and extends down into the top of the Connoquenessing. See Plate IX, A.

The coal beds are often limited in extent by recent erosion, and the erosion channels are later filled with hill-wash or glacial till, or by lake deposits associated with the glaciers. It is a common condition in the coal measure area of Pennsylvania that soil creeping down the hillsides accumulates in the valley bottoms, and may reach a depth of 50 or 60 feet. This condition may be entirely unsuspected at the surface unless revealed by the drill. Under these circumstances coal beds have frequently been assumed to continue unbroken beneath streams until mining reveals that the coal has been cut out. In some places this is a source of large danger because this valley-filling material is often full of water, and when encountered in mining the water may flow into the mine workings. In one or two instances a rush of water from this source has been very disastrous both to life and property. Within the glaciated region such deposits may be of wide extent, so that it is not possible from the surface alone to determine the area actually underlain by coal.

Splitting beds. Normally a coal bed is a definite unit, with certain characteristic benches and partings, all contained within a thickness of a few inches or a few feet. In all coal fields, however, irregularities in bedding occur, including the splitting of coal beds. A single bed in one part of an area may separate by increase in thickness of a parting into two beds in adjoining areas. A good example of this is the Moshannon bed in eastern Clearfield County. In a large area, extending from Houtzdale to Morrisdale, this has been a fine workable bed apparently solid except for a thin streak of cannel coal in the middle. This cannel coal suggests temporary

A. Stratigraphic irregularities characteristic of the "Coal Measures." Here the base of the Homewood sandstone descends sharply across the Mercer shales, cutting them off diagonally. Evidently after the Mercer beds were laid down they were lifted out of the sea and their surface was eroded into slight valleys. Afterwards the area was depressed and sand washed in which later became the Homewood sandstone. Such evidences of land movement are common all through the "Coal Measures."



B. Joint structure or cleat in coal bed. Picture shows mining face of room after coal has been shot down. Notice long smooth joint surfaces (face cleat) parallel with the face of the room. At nearly right angles with these are the short joints (butt cleat), shown especially well at top near center.

Structural features affecting coal.

Photograph by courtesy of U. S. Bureau of Mines.

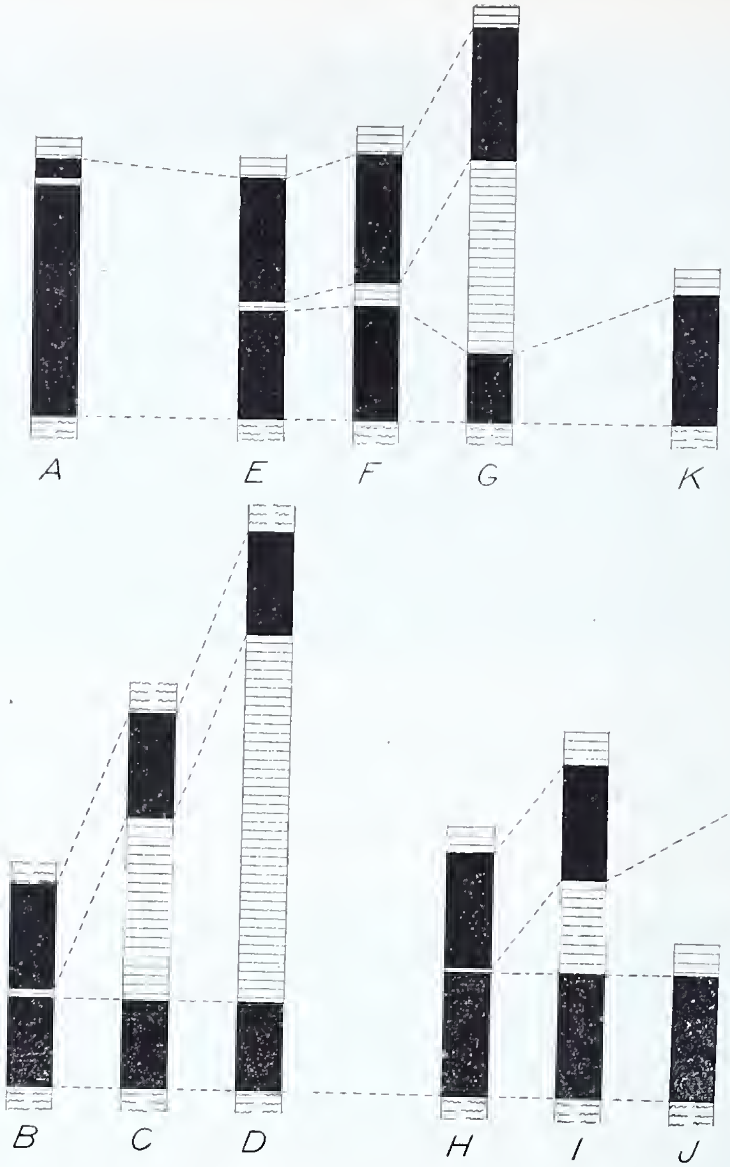


Fig. 4. Sections showing splitting of Lower Freeport coal bed in mines on Muddy Creek, Clearfield County.

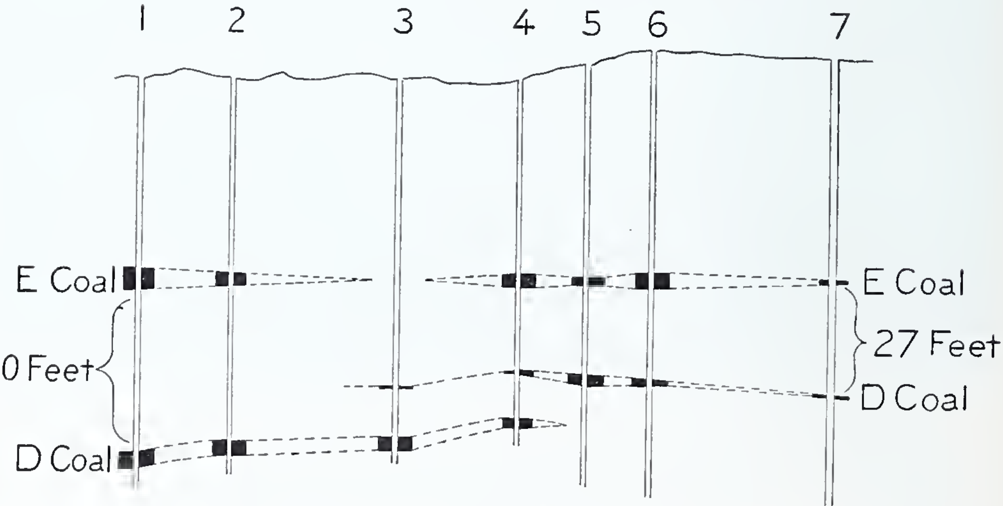


Fig. 5. Sketch showing overlapping of coal beds at one horizon.

flooding but without the washing-in of much muddy material. Along Muddy Run, however, this bed begins to break into two benches, as shown in Fig. 4, and these benches separate until one drill hole record is reported to have shown them 55 feet apart.

Very similar splitting has been noted in the Bernice field of Pennsylvania, and in nearly every coal field in the world.

Structure or Lay of Beds

Folding. When laid down the coal beds must have been practically at water level, and nearly or quite horizontal. Today, however, they are usually inclined at greater or less angles, so that the water in a mine will flow to one point and the haulage may be with or against the grade. In Pennsylvania a period of crustal folding came at the end of the Carboniferous Age. During this period were produced the great folds that resulted in most of the rocks on the Allegheny Front and eastward being turned at high angles, and crushed, broken, or greatly crumpled. West of the Allegheny Front the beds were only gently folded. The folds are known as anticlines and synclines, an anticline being an up-fold or ridge, a syncline a down-fold or basin. The dip or pitch of the rocks may range from a very few feet to the mile to as high as 400 or 500 feet to the mile. A single fold may be 5 to 10 miles wide, and of very great length. Indeed, it is thought that the fold responsible for Chestnut Ridge can be traced from north-central Pennsylvania through West Virginia and Kentucky into Illinois, and even farther west. Most of the anticlines or synclines, however, are relatively short, from 5 to 25 miles long. Even where long the position of any one rock along the crest of any one anticline is not constant, but rises and falls until at the end of an anticline it noses down, or at the end of a syncline it tips up. On the crest of long anticlines there are many structurally low places or saddles.

Jointing. Rocks that have been under horizontal pressure usually break in vertical planes. Such breaks, called joints, may be tight or open, but usually divide the bedded rocks in blocks with parallel sides. These planes affect the coal beds as well as the other rocks. In the coal beds they are commonly called "cleat." This cleat consists of two sets of parallel joints, commonly not quite at right angles to each other though usually vertical to the bedding. These faces, in some coal fields at least, appear to be definitely related to the structure and maintain almost exactly the same directions over large areas. In mining, the coal usually breaks away from the bed along these joint planes. The two sets of joints are of unequal importance; one is usually much more pronounced than the other, producing larger and more continuous faces as seen in the mine. This joint is commonly known as the face joint or cleat. The other joints,

known as butt joints or cleat, commonly break at the face joints, running only from one face joint to the next. In the old system of hand mining, and to a lesser extent in machine mining, these joints play a large part as they help to loosen the coal when it is mined and to guide the miner in keeping his room sides straight and true. In block coals, which include the cannel coal of Pennsylvania and the block coal of Indiana, these joints may extend continuously the whole thickness of the bed, so that it is possible to take out blocks of coal as high as the bed is thick, and as large as can be handled in the mine.

Faults. Reference here is made not to "faulty coal" in the mine, which may be the result of several causes, but to breaks in the earth's

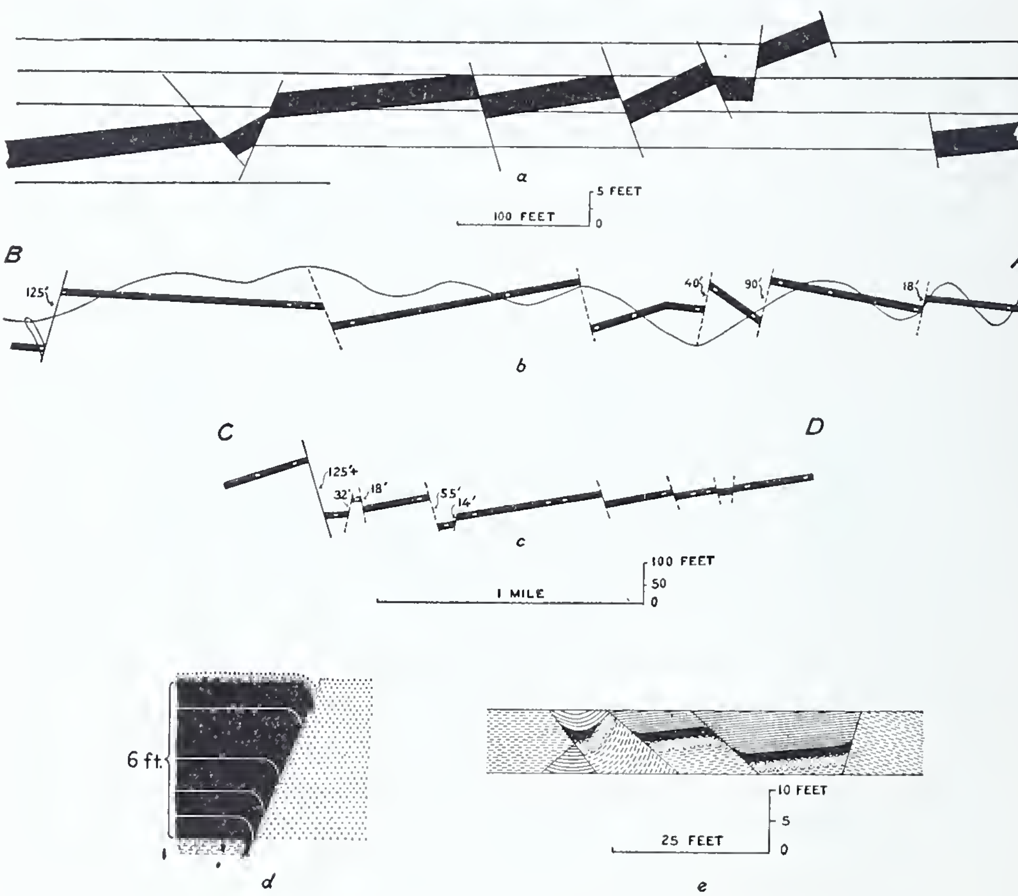


Fig. 6. Faults in the Houtzdale quadrangle, Pennsylvania.
a. Faults in Plane mine near Mineral Spring.
b. Faults between Houtzdale and Osceola on a NE-SW line through Moshannon.
c. Faults along Whiteside Run.
d. Trace of fault in Eureka No. 5 mine showing drag.
e. Sketch in mine at Bigler.

crust involving both the coal beds and other rocks, with displacement along the break. Such faults are common near the Allegheny Front, and less common elsewhere. Figure 6 shows examples of these faults in eastern Clearfield County.

As shown in the figure, these faults displace the coal from a few feet to 125 feet. Other faults not here shown make a displacement of 200 feet or more. As shown in A of the figure, these faults have the apparent form of what the geologist calls normal faults, faults in which rocks on one side of a break have dropped relative to those on the other side. Examined in the mine, it is noticed that scratches produced by the sliding of the rocks on one side of the fault against the rocks on the other side are nearly horizontal, indicating that the movement was not downward but involved large horizontal thrust. Indeed, a study of these faults leads to the conclusion that they are not the result of stretching the earth's surface and therefore not normal faults, but the result of difference in yielding to pressures along the line of the fault by the rocks on either side. Apparently the rocks on one side have buckled up while those on the other side have buckled down or what is more probable have shortened without buckling as the actual shortening in any instance would amount to only a few inches. Faults produced by pressure are commonly called "reverse" faults. These faults, however, do not have the ordinary form of reverse faults. Some of these faults can be traced from one end to the other within a single mine. Some of them are many miles long. As a rule they are not clearly evident upon the surface but are disclosed only by mining operations. In a few places the movement along the fault has been just sufficient to place the broken edge of one bed against the edge of another bed, and mining is carried from the one bed to the other with little or no break, sometimes greatly puzzling the miners over the apparent sudden change in the character of the bed. As a rule these faults do not appear to have affected the coal beds and rocks on either side of the break for more than a few inches or a foot. Figure 6d shows conditions in Eureka No. 5 mine south of Houtzdale where, along a fault with a throw of 125 feet, the broken edge of coal was displaced at one place for only about 2 feet back from the fault face. At other places the strata are bent downward 5 or 6 feet so that the roof of the coal descends nearly or quite to the level of the floor. In nearly all places a stringer of coal extends down or up the fault plane, usually mixed with clay, from the underclay of the coal. In some places it has been possible to detect the presence of faults at distances of 50 or 60 feet from the fault plane by slickensiding in the coal and also by certain slight changes in the coal as though it had been somewhat affected by heating, though analysis of this coal does not appear to indicate a higher percentage of fixed carbon or a smaller percentage of volatile matter. Locally a fault may branch into two faults. One near Houtzdale with a 50-foot displacement divides into two faults, one with a 20-foot and the other with a 30-foot throw.

Crushed coal. Pressures that produce faulting or rock folding may crush the coal, sometimes greatly thickening a coal bed in so doing. Here and there near Coalport, Clearfield County, such thickening and thinning is displayed; but in the anthracite region and in other areas earth movements have resulted in thickening beds in some places and thinning them in others. In the anthracite region at one point a 20 foot bed is thickened to over 100 feet. A very thin bed at Rockwood, Tennessee, has thickened similarly. Figure 7 was drawn from the rocks in a cut along the New York Central Railroad near McGees Mills, Clearfield County, showing what this pressure may do locally.

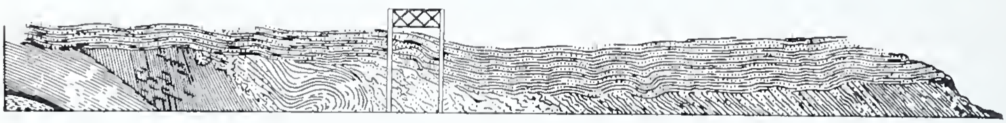


Fig. 7. Crushing and folding of shales, coal, and sandstones underlying a massive sandstone that would not yield to the folding pressure.

Veins in coal. In at least two places in Pennsylvania, coal beds are penetrated by veins of igneous rock, one in Indiana County and the other in Fayette County. This rock at Dixonville, Indiana County, probably was not very hot when it penetrated the coal because where the vein is 45 feet thick the coal is coked slightly for about eight inches adjacent to the vein. In some places similar veins of igneous rock have not only penetrated the coal but forced their way along the bedding planes above or below the coal, and near enough so that the heat has changed the coal either to anthracite or natural coke.

Pressure has in many places produced crevices in the coal. Clay from below the coal has been squeezed into some of these forming clay veins; into other crevices from the top sand has washed forming "sand veins," or "rock spars." These clay veins and sandstone veins may be of very irregular thickness and shape. In some beds the number of these veins render the coal unmineable.

"Horses," "rolls," etc. In addition to these vein-like inclusions of clay and sandstone, coal beds are subject to many other irregularities caused by pressure and erosion.

In many mines these "rolls" of the roof or floor are places where the roof or floor bulges down or up or becomes rolly, or there may be irregular masses of clay, especially, or of sandstone or other rock included in the coal bed. In most instances these are due to pressure which has fractured the coal and squeezed into fractured places clay or other material from the advancing rocks.

Weathering of Beds

It is well known that where a coal bed outcrops the coal is changed both physically and chemically. Physically the structure breaks down, the coal tends to disintegrate at the surface to a black mass which is called a "coal bloom." However, a little of this black powder broken on the finger nail will commonly reveal bright fracture surfaces. The weathering also tends to change the iron sulphide or pyrite into iron oxide. Thin films of iron oxide on the surface of the coal have irridescent colors and give the name "peacock coal." Coals which normally are coking become non-coking on the weathered outcrop.

AGE OF COAL

Geologic time scale. The table on the next page is a general time scale of the eras, ages, and periods, with the locality where minable coal of each period is found.

Geologic Time Scale

Eras	Ages	Periods	Where coal of period is found
CENOZOIC	Quaternary	15th or Quaternary	New Zealand, Borneo.
CENOZOIC	Tertiary	14th or Upper Tertiary	Alabama, Mississippi, Montana, Louisiana, California, Alaska, France, Germany, Italy, Switzerland, Bohemia, Austria, Russia, Japan, Siberia, Philippines, Borneo, New Zealand.
CENOZOIC	Tertiary	13th or Lower Tertiary	Gulf States, Rocky Mountain States, Great Plains and Pacific Coast States, Alaska, Western Canada, Mexico, Peru, Colombia, Ecuador, Venezuela, Central America, most European States, Arabia, Malay Peninsula, Java, Borneo, New Zealand, Tasmania.
MESOZOIC	Cretaceous	12th or Upper Cretaceous	Texas, all Rocky Mountain and Great Plains States, Western Canada, France, Servia, Austria, Spain, Japan.
MESOZOIC	Cretaceous	11th or Lower Cretaceous	Wyoming, Montana, South Dakota, Western Canada, Servia, Bulgaria, Spain, Southern Australia.
MESOZOIC	Jura-Trias	10th or Jurassic	Montana, Alaska, Greenland, Italy, France, Spain, Servia, Portugal, Norway, Austria, Hungary, Russia, India, Japan, Chosen, Manchuria, Africa, New Zealand, Tasmania, New South Wales.
MESOZOIC	Jura-Trias	9th or Triassic	Virginia, North Carolina, Mexico, France, Denmark, Italy, Spain, Austria, Sweden, Australia, Tasmania, Africa, (a little in Pennsylvania).
PALEOZOIC	Carboniferous	8th or Permian	Pennsylvania, West Virginia, Ohio, France, Saxony, Bohemia, India, China, Manchuria, Australia, Africa.
PALEOZOIC	Carboniferous	7th or Pennsylvanian "Coal Measures"	Rhode Island, Pennsylvania, and Appalachian States, Mississippi Valley States, Eastern Canada, Brazil, Uraguay, Great Britain, France, Germany, Belgium, Austria, Spain, Portugal, Russia, etc., etc.
PALEOZOIC	Carboniferous	6th or Mississippian	Virginia, Scotland, Ireland, France, Russia, Spitzbergen, Turkestan, unimportant beds in Pennsylvania.
PALEOZOIC	Siluro-Devonian	5th or Devonian	Norway, Russia.
PALEOZOIC	Siluro-Devonian	4th or Silurian	
PALEOZOIC	Taconic	3rd or Ordovician	
PALEOZOIC	Taconic	2nd or Canadian	
PALEOZOIC	Taconic	1st or Cambrian	
		Pre-Cambrian	

Age of Pennsylvania coals. The commercial coals of Pennsylvania all belong in the middle Carboniferous or Pennsylvanian system or "Coal Measures," and the basal Upper Carboniferous or Permian. A little coal occurs in the 6th period, or Lower Carboniferous (Mississippian). In places coal beds of this age are of workable thickness, but where of workable thickness these coals invariably proved to be too irregular or of too low grade for working under present conditions. A little coal is also found in the rocks of the 9th period or Triassic. At most places these latter beds are only a few inches thick, but in a few places beds a foot thick or more have been found.

Age of coals elsewhere. The coal of all the Appalachian States and the Mississippi Valley belongs in the 7th period, but the coal of the Great Plains and Rocky Mountain region belongs mainly in the Upper Mesozoic and Lower Cenozoic, particularly in the 12th period, or Upper Cretaceous, or in the 13th period, or Lower Tertiary. The principal coal fields of Europe are also those of the 7th period or Coal Measures. The coals of the later ages are commonly of lower rank, those of the Lower Tertiary usually being lignite or subbituminous coal, though locally coals of high rank of this age are found.

Geological history of Pennsylvania coal fields. The coal of Pennsylvania is believed to have been laid down in widespread swamps during the 7th and 8th periods which formed the Middle and Upper Carboniferous. During those periods the whole eastern and central part of the United States appears to have been in critical adjustment to sea level, now above and now below, with sinking dominating over uplift, leading to the gradual accumulation of beds of coal and of the accompanying shales, sandstones, limestones, and clays. Uplift might bring the recently deposited sediments of coal swamps just up to water level and prevent any erosion, or the uplift may have been high enough above sea level to allow considerable erosion.

The rocks laid down in the lower part of the 7th period are lacking in western Pennsylvania, owing to that area having been uplifted and above sea level during early Pennsylvanian time. The coals of Alabama, Tennessee, of the Pocahontas and New River district of West Virginia, and the lower Lykens coals of the Pennsylvania anthracite region were laid down while western Pennsylvania was still above sea level. Then came settling in that area followed by the laying down of the coals found there today.

The end of the Permian or earlier saw all of the rocks in what is now Pennsylvania undergoing folding and crushing apparently from the southeast. Probably there was a deep basin lying east of the Allegheny Front in which the Lower and Middle Cambrian and pre-Cambrian rocks were laid down to a depth of perhaps 20,000 feet. When the rocks of the State underwent this gigantic squeezing move-

ment the western border of this early basin appears to have served as a buttress preventing the close folding of the rocks west of that buttress. Accordingly today we find the rocks east of the Allegheny Front folded into steep-flanked anticlines and synclines with many faults, while west of the Allegheny Front the folds are gentle and involved only a very few feet of shortening between the Allegheny Front and the western border of the State.

This movement may have continued during a large part of the 8th period, and possibly all of the earlier part of the 9th period, or Triassic. It is probable that as the rocks were uplifted by the folding, which went on very slowly, they were at the same time being eroded, and this erosion may have gone on fast enough to prevent their ever reaching anything like the mountainous height that would be implied if the tops of the folds were completely restored. If such erosion had not taken place, some of the folds east of the Allegheny Front possibly would have reached elevations above sea level of 25,000 to 40,000 feet. Granting that the time of the uplift was long and that the erosive action nearly kept pace with the upfolding of the recently deposited beds, it is probable that the top of the arches formed by the folding never were more than a few thousand feet above sea level. During Mesozoic time erosion continued to eat away and carry off the tops of those folds, with the result that, probably in later Mesozoic time, the whole State was reduced to a nearly level plain. The eroding of the upper parts of these folds meant the removal not only of great volumes of rock but of a very considerable part of the beds of coal, so that, in the eastern part of the State, only fragments remain as found today in the anthracite fields and in the Broad Top field. Since that time, probably during the Tertiary, this State has been subject to uplift occurring in stages separated by long periods of quiet. Each uplift caused the rivers to deepen their channels and each quiet period eventually effected the widening of their valleys. Some of these periods of uplift were sufficient to remove nearly all traces of the earier level planes and succeeding stable condition produced new planes. The hilltops of western Pennsylvania west of Chestnut Ridge are remnants of a plane developed during one of these later periods of quiet. The flat crest of Chestnut and Laurel ridges, and of Allegheny Mountain belong to one of the earlier planes of erosion. This general uplift has continued by stages to the present.

The region of the Ohio, Allegheny, and Monongahela rivers has been involved in changes produced by the two or more glaciers that entered the State from the northwest. Before the Glacial, or 15th period, the Monongahela and upper Ohio are believed to have turned northward up the Beaver Valley and out the Grand River into the Erie Basin. The upper Allegheny ran into the eastern part of the

Erie Basin. Clarion River was then the northernmost head of Allegheny River. The first advance of the ice closed all of these outlets temporarily, flooding the region about Pittsburgh, and up the Allegheny, the Monongahela and other valleys, and filling the valleys with debris from the melting edges of the glaciers. In this way the high river gravels found in the Allegheny and Ohio valleys, and similar gravels on the old bends of the Monongahela were accumulated. The first ice must have blocked the northward passage of these streams long enough for the Ohio to find an outlet by its present course, and to cut a channel deep enough to prevent a return to the old channel up the Beaver after the retreat of the ice.

At the time of the earlier ice advance the drainage of the upper Ohio at Pittsburgh was running in rock cut channels about 200 feet above the present river level. The broad flat extending from Braddock past Edgewood, East Liberty, Schenley, is one of these old channels since abandoned for the shorter course by way of Homewood, and Hazelwood. Between the first and second advance of the ice, enough time elapsed for the rivers to deepen their valleys not only to the present river level but 25 to 100 feet lower. During the second advance of the ice a vast quantity of sand, gravel, and clay was poured down the Allegheny River, filling that river valley to a considerable depth. Later erosion has more or less cleared out that valley, but has left a large volume of gravel under the river and some along the river banks. The immediate banks of the rivers of the Pittsburgh region therefore date from the time between the two ice advances.

THE BITUMINOUS COAL DEPOSITS OF PENNSYLVANIA

General

Location and extent. The bituminous coal field of Pennsylvania covers most of western Pennsylvania, extending from the southwest corner northward almost to Lake Erie and eastward to the Allegheny Front, and northeastward to the southern boundary of New York, and eastward through the north-central counties of the State. The area is about 14,200 square miles. This field forms the northeastern end of the Appalachian Coal Region, which in turn is a part of the Eastern Coal Province. The coal bearing rocks cover practically all of Greene, Washington, Westmoreland, Beaver, Lawrence, Butler, Armstrong, Jefferson, Indiana, Clearfield and Cambria counties, the greater part of Fayette, Somerset, Elk, Clarion and Mercer counties, besides parts of Crawford, Venango, Forest, Warren, McKean, Cameron, Blair, Huntingdon, Bradford, Fulton, Centre, Clinton, Potter, Lycoming, Tioga and Bradford counties.

The boundary of the coal field is extremely irregular. On the north the boundary runs from the northwest corner of Crawford County across Warren and McKean to Potter and Clinton counties, thence extends as outlying patches into Tioga, Bradford and Lycoming counties. From Clinton County the boundary follows the Allegheny Front southward through Centre County, and between Cambria and Blair and Somerset and Bedford counties. East of the latter line is the Broad Top field in Huntingdon, Bedford and Fulton counties, lying about 30 miles east of the main field and having an extent of about 50 square miles. As here defined the bituminous field does not include the semi-anthracite (Bernice) field of Sullivan County.

Growth in knowledge of the field. Knowledge of the bituminous coal field of Pennsylvania has been obtained mainly through the work of four State Geological Surveys, and of the United States Geological Survey. The first State Survey was active from 1836 to 1842 and again from 1851 to 1854. The main results of this work were published in 1858 in two large quarto volumes. This survey determined the general geology of the State, though almost no detailed work was done.

In 1874 the Second Geological Survey of the State was provided for on a liberal scale, and lasted for 13 years. This Survey published the results of each season's work as fast as possible. The coal field was covered by a series of county reports, usually accompanied by more or less detailed county maps.

In 1899 the State again appropriated for geological work, this time in cooperation with the United States Geological Survey. This

Survey provided first for detailed topographic mapping on the scale of approximately 1 mile to the inch, followed by detailed geological mapping. Mapping, both topographic and geologic, followed quadrangular areas of 15″ of latitude and longitude. This cooperative survey continued until 1908 when the Third or "Commission" State Geologic Survey was established by law. Lack of funds greatly restricted work by that Survey. In addition to the cooperative work done by the U. S. Geological Survey, that Survey has from time to time carried on independent topographic and geologic work in the coal fields of Pennsylvania. A summary of the history and general results of the cooperative work in Pennsylvania was published in the Report of the Topographic and Geologic Survey Commission of Pennsylvania for 1906-1908. The detailed results of the cooperative work have been published by the U. S. Geological Survey in the form of folios and bulletins. In addition the Third State Survey published a number of bulletins.

In 1919 an Act was passed by the General Assembly creating a new Topographic and Geologic Survey and abolishing the old Survey This may be known as the fourth Geologic Survey, and its publications are published under the heading Pennsylvania Geological Survey, Fourth Series. Since the organization of this Survey detailed mapping has been done by it on the Pittsburgh, Greensburg, and Meyersdale quadrangles, and by the United States Geological Survey on the Somerset, Windber, New Kensington, Butler, and Zelienople quadrangles. The State Survey cooperated in the work in the New Kensington quadrangle. In addition Mr. James D. Sisler of the State Survey visited nearly all of the coal mining areas of Pennsylvania, traveling some 10,000 miles and studying the coal mines in those areas. Later, under cooperative agreement with the United States Coal Commission named by President Harding, he revisited the several coal mining districts of Pennsylvania, studying mining methods and mining losses. These studies led to the publication of two bulletins.[1]

In 1921 Mr. E. G. Hill spent the summer in obtaining coal samples from mines which, under a cooperative agreement with the U. S. Bureau of Mines, were analyzed by the Bureau at Pittsburgh. In 1922 this work was continued by Mr. Hill and by L. D. Woodworth. All told 271 mines were sampled and 755 samples were cut. These likewise were analyzed in the Pittsburgh laboratory of the U. S. Bureau of Mines. In addition, cooperation was established with the State Department of Mines, and the several mine inspectors as they visited mines within their district made notes on the mines visited. Copies of these notes were filed with the Geological Survey

[1]Bituminous Coal Losses and Mining Methods in Pennsylvania, by James D. Sisler: Penn. Geol. Survey, Bull. M4, 1924.

Bituminous Coal Fields of Pennsylvania, by James D. Sisler: Penn. Geol. Survey, Bull. M 6, Pt. II, 1926.

and have been used extensively in the preparation of Part II of this report. In addition, the author had drawn heavily upon a considerable volume of unpublished information obtained by the State Geologist and others, during earlier years under the cooperative agreement which existed between the U. S. Geological Survey and the Topographic and Geologic Survey Commission of Pennsylvania. This includes many detailed maps and notes on the Houtzdale, Curwensville, and New Castle quadrangles.

THE COAL MEASURES

General character of rocks. The rocks of the coal measures of Pennsylvania are sandstone, shale, limestone, clay and coal. They occur in beds of irregular thickness and lateral extent in repeated series irregularly disposed one above the other. The succession most commonly found is: sandstone, limestone, clay, coal, shale, sandstone, in ascending order. This order may be varied indefinitely, but is found more commonly than any other. The relation of the clay and coal is almost invariable, though clay is also found in other

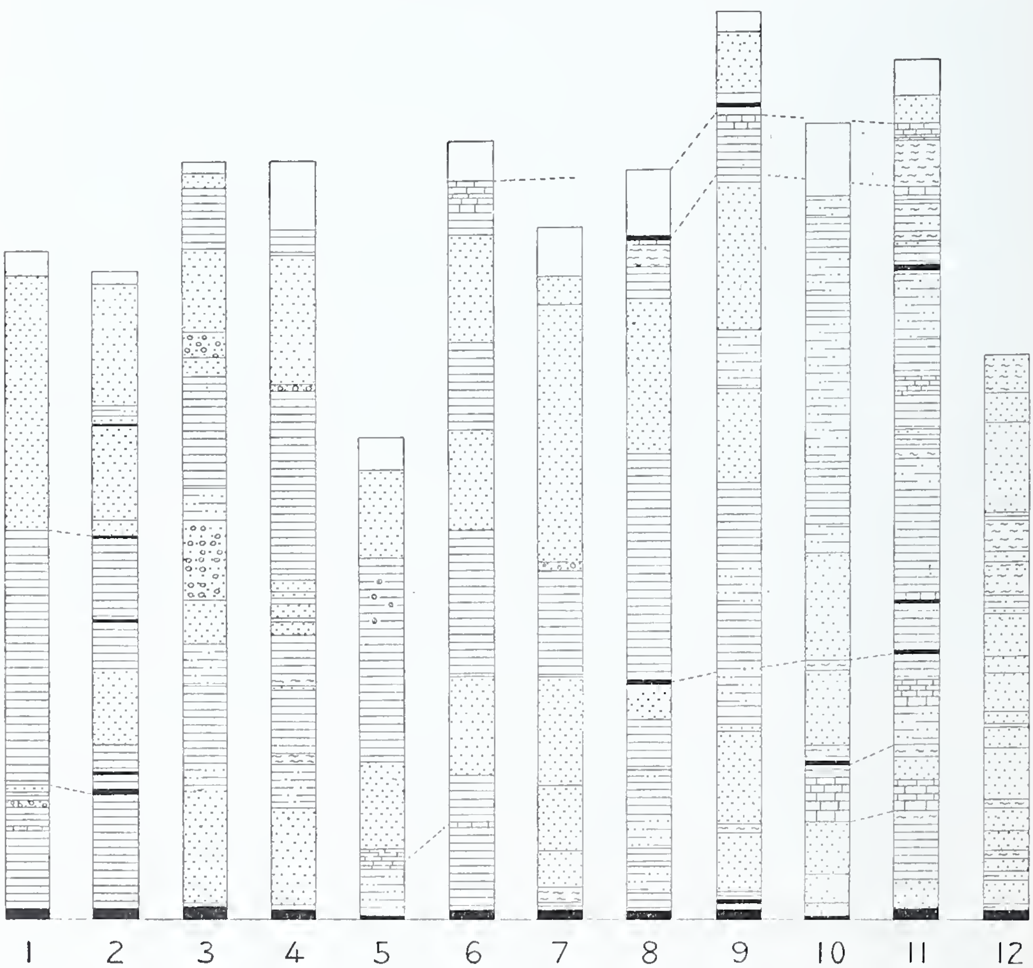


Fig. 8. Irregularity of strata above Upper Freeport coal, from wells in a single township, Jefferson County.

positions. Shale and sandstone make up the bulk of the series of rocks. The shale ranges from fine grained clay shale to sandy shale or shaley sandstone. Most of the coal measure shales carry a high percentage of sand. The sandstones range from the fine grained shaly sandstone just mentioned to conglomerate. The latter seldom has pebbles over 1 inch in diameter. The finer grained sandstones may carry a large admixture of clay matter and weather readily, while the coarse grained sandstones as a rule contain little but pure sand, commonly cemented by iron, which tends to discolor the characteristic gray with yellow or red bands or blotches. The individual beds of sandstone rarely have a thickness of more than 50 feet. The shale beds may be thicker. The sandstone beds may have a very local development, often mere lenses, whose thickness is an appreciable percentage of their horizontal extent or, more often, a sandstone bed may be traced from a fraction of a mile to several miles. Less frequently it is possible to trace the sandstone a score or several score of miles without visible interruption, or break. The coarse grained sandstones commonly have a wider horizontal extent than the finer grained sandstones. As a result of this irregularity in the thickness of the shales and sandstones especially, rock

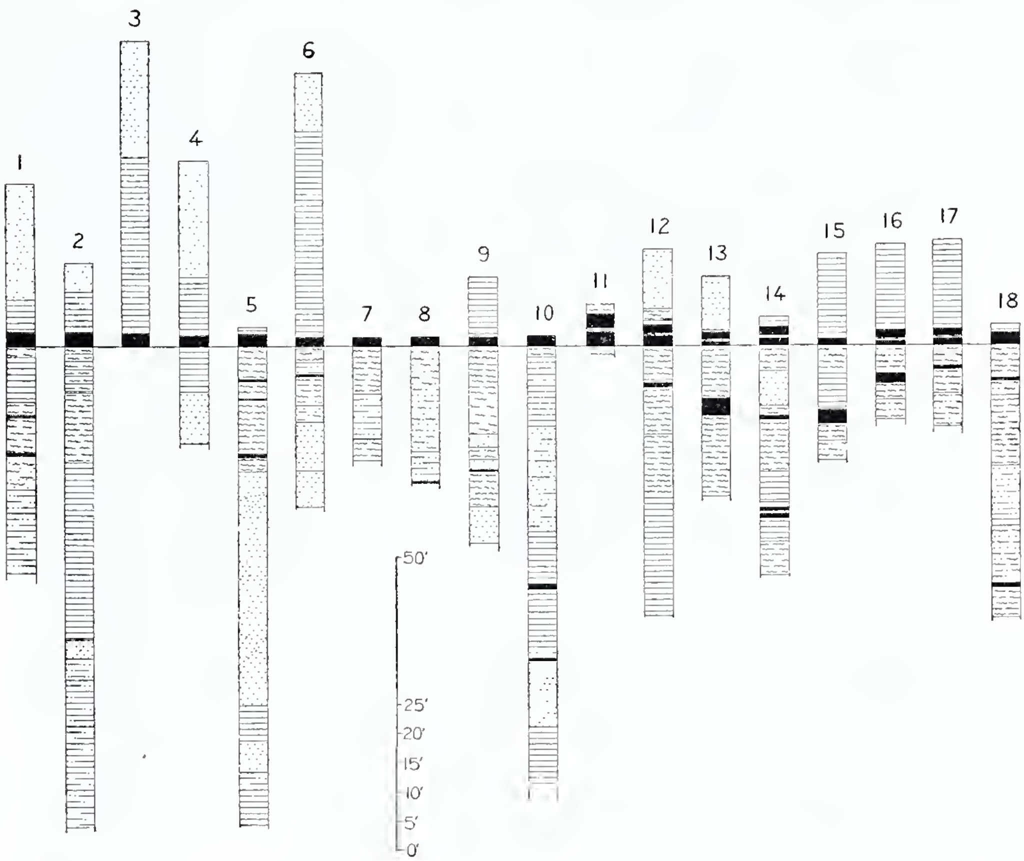


Fig. 9. Irregularity of strata below Lower Kittanning coal. West Branch of Susquehanna River between Curwensville and Clearfield.

sections on opposite sides of a hill or of a valley or from adjacent drill holes often have little resemblance.

The limestone, clay and coal beds are much more regular than the shales and sandstones. The limestones are commonly thin or lacking in the eastern part of the field but are more numerous, more persistent and thicker toward the west. On the contrary the shales and sandstones are thicker at the east and become thinner, taking the section as a whole, toward the west. The clays immediately underlying the coal beds are the most persistent of any of the strata, and in some instances it seems almost possible to trace single beds entirely across the field within their uneroded area. Next to the clay beds in persistence are the coal beds, to be described beyond.

Thickness. The total thickness of coal measure rocks in western Pennsylvania is between 2,500 and 3,000 feet. Sandstone, shale, and limestone alternate all through the section, but as a rule sandstone predominates in the basal portion, while on the whole shale dominates the rest of the section. Probably shale forms two-thirds of any considerable section of the rocks. On the average limestone forms hardly one-tenth of the rocks. It is less abundant in the lower part of the section and of greater thickness in the upper part of the section. Coal beds are found in all parts of the section but the thicker beds occur mainly in two belts, the upper commonly a little under 400 feet thick, the lower about 300 feet thick separated by about 600 to 900 feet of rocks in which the coals are commonly thin. Above the upper belt are 1,100 to 1,200 feet of rocks, found only in the extreme southwest corner of the State. Below the lower belt are 100 to 300 feet of rocks, of which the upper 100 feet underlies the whole field while the greater thickness is found only in the west or northwest part of the field. This difference is due to irregularity of the surface on which the Coal Measures were laid down, or to differential sinking of that surface during the laying down of these lowest rock, or to both.

Subdivision of Coal Measures. The early Surveys called the two principal belts of coal-bearing rocks in Pennsylvania the "Upper" and "Lower Productive Measures." Later the lower belt was called the Allegheny group, from its exposures along Allegheny River, and the upper was called the Monongahela group from its outcropping on Monongahela River. The intermediate beds were at first called and "Lower Productive Measures." Later the lower belt was called group, from the outcrops on the river of that name. The rocks above the Monongahela group, at first called the Upper Barren Measures, are now called the Dunkard series and divided into the Washington group below (from Washington County) and the Greene group (from Greene County) lying above. The rocks below the Allegheny group are part of the Pottsville series, named from the city of Pottsville in the eastern part of the State.

The United States Geological Survey has applied the term formation to the names Allegheny, Conemaugh, Monongahela, etc. Considering the number of named beds within each of these "formations" it seems desirable to use the old term "groups," as used by the Second Geological Survey of Pennsylvania, and subdivide them into a number of smaller successions of rocks to which the name member is applied. Thus, the Allegheny group may be divided into the Clarion, Kittanning, and Freeport members. The name of the member may then be applied to all of the rocks within that member. Where two or more rocks of the same character occur in one member they may be distinguished as Lower, Middle, and Upper; for example: the coal beds in the Freeport member have long been known as the Lower and Upper Freeport coals. In the same way the under clays can be called the Lower and Upper Freeport; or the designa-

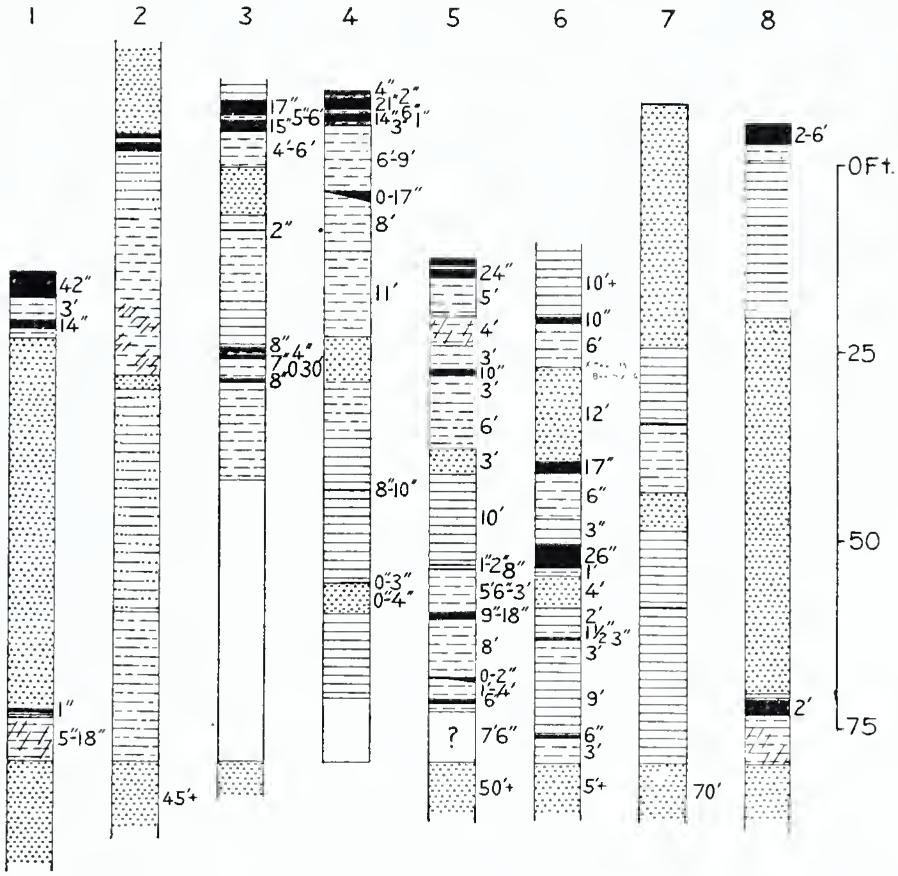


Fig. 10. Irregularity of strata near Brookville and Mercer coals in central Clearfield County.

tion may be, following Second Survey practice, Freeport, Lower coal; Freeport, Upper coal; Freeport, Lower clay; Freeport, Upper clay, etc.

Names of beds. Within these broader designations the individual beds have been named as, for example, the Pittsburgh coal bed, the

Homewood sandstone, Vanport limestone. Thus all of the more persistent layers of coal, clay, limestone, and sandstone have been named. The shales have, as a rule, been considered as "filling," and not named unless they carried fossils that served to characterize a horizon. Most of the names given are derived from the name of some town or stream on or near which the bed outcrops, as in the examples cited. Some of the beds carry the same name over all of the field, as for example, the Pittsburgh bed. Other beds, and this is generally true, have been given a number of local names. For example, the bed named by Rogers the Lower Kittanning coal has been correlated with beds passing under the following, and other names: Miller, New Castle, Limestone, Keys Creek, River Hill, Winslow, Bloss vein, Fulton, Creek vein, Potter, Letonia, Mineral Point, Lower New Lexington, Ellerslie, Bender, Corinth, White Rock, Barrett, Dagus, Barnett, and so on. In most of these places the bed was named before its probable correlation was known or perhaps even suspected.

Again, in many instances the same name has been applied to a number of beds which are then distinguished as upper, middle and lower, or by added letters, or by the addition of "Little." "Little" usually implies that the bed lies below the bed bearing the same name, without "Little." The name Washington (Washington County, Pa.) is an example of this kind. Thus in the Washington group are found the Upper Washington coal, Upper Washington limestone, Middle Washington limestone, Washington A coal, Lower Washington limestone, Washington coal, Washington sandstone, and Little Washington coal.

The purpose of naming a bed is to facilitate its description or to make definite a reference to it, and to show its relations to other beds in the same region or with the same or other beds in other regions. So long as the relation of a bed to beds in other regions is not known or is highly hypothetical, the use of local names is highly desirable or necessary. But when work has been extended over any region so as to allow the correlation of coals or other beds with some degree of probability or certainty, it becomes highly desirable that the same name be used for the same bed as far as it can be traced with certainty. At the same time it becomes desirable, if possible, to indicate the relative position of beds. Supposing the relative position of all beds to be fully and definitely known, some system of numbers or letters would indicate such relative position without any question, but letters or numbers alone are difficult to remember as applied to any one bed. In naming the coals and other beds of the Coal Measures, therefore, it has seemed desirable to adopt a combination of these two methods, using names already widely known for the larger subdivisions, and applying numbers or

letters for the less well-known subdivisions, at the same time doing away with a host of names of beds not widely known. On a preceding page was given a short time scale. In that table the earlier ages are given little space because they are not coal bearing. As a matter of fact the earlier ages are commonly represented by greater thicknesses of rock and probably represent greater time intervals than the later ages. In this report we are concerned primarily with the Carboniferous age. In the following table are presented the later subdivisions of the Carboniferous.

For purposes of abbreviation the letter C may be used to represent the Carboniferous, as D is used for Devonian, S for Silurian, etc. The Carboniferous Age is commonly divided into three periods, known as the Lower Carboniferous or Mississippian, the Middle Carboniferous or Pennsylvanian, the Upper Carboniferous or Permian. The Mississippian derives its name from the Mississippi Valley where rocks of Lower Carboniferous age occur widely. The Pennsylvanian derives its name from Pennsylvania where Middle Carboniferous

Principal Subdivisions of the Carboniferous Age

Era	Age	Period & System	Epoch or series (E) European equivalents	Code	Code No.	Code letters	Group
PALEOZOIC	CARBONIFEROUS	Eighth Period or Permian	Upper Permian (E—Thuringian)	C9			*
			Middle Permian (E—Saxonian, Penjabian)	C8			*
			Lower Permian "Dunkard" (E—Artinskian, Autinian)	C7	8.2 8.1	Cg Cw	Greene Washington
		Seventh Period or Pennsylvanian	Upper Pennsylvanian (E—Stephanian, Uralian)	C6	7.9 7.8 7.7	Cm Cc Ca	Monongahela Conemaugh Allegheny
			Middle Pennsylvanian Kanawha or Upper Pottsville (E—Westphalian, Museovian)	C5	7.6 7.5 7.4	Cuk Cmk Clk	Upper Kanawha Middle Kanawha Lower Kanawha
			Lower Pennsylvanian Lower Pottsville (E—Namurian)	C4	7.3 7.2 7.1		Upper New River* Lower New River* Pocahontas*
		Sixth Period or Mississippian	Upper Mississippian or Chester, or Mauch Chunk	C3			Mauch Chunk in Pa. (Generally absent in western Pa.)
			Middle Mississippian or Meremee	C2			Absent in Pa. (except for Loyalhanna ls.)
			Lower Mississippian Waverly (Pocono subseries)	C1			Lower half is represented in Pa. by Pocono.
	Siluro-Devonian	Fifth Period or Devonian					

* Not represented in Western Pennsylvania.

rocks are widely distributed and have been extensively exploited by mining. The Permian takes its name from the Russian Province of Perm, where Upper Carboniferous rocks cover a large area. Each of these periods is represented in Pennsylvania and elsewhere by a thick succession of rocks to which the name system is given. Thus, while the period is known as the Pennsylvanian or the Seventh Period, the rocks are known as the Pennsylvania system. Each of these periods or systems is in turn divided into epochs or series, epoch applying to time and series to the rocks. These may be described as Early, Middle, and late Pennsylvania, or as lower, middle and upper Pennsylvanian, as applied to rocks.

In the table which follows the Allegheny has in turn been divided into three members, the Clarion, Kittanning and Freeport, each of which covers many named beds as shown in the table. The Conemaugh has been divided into nine members, each averaging, as a maximum about 100 feet thick. All told, nearly eighty minor beds in this group have received names. The nine members are here designated Mahoning, Buffalo, Saltsburg, Grafton, Barton, Morgantown, Lonaconing, Connellsville, and for want of a better name, Little Pittsburgh. These are designated in abbreviated form Cc1 to Cc9.

The Monongahela is here divided into five members designated as Pittsburgh, Redstone, Sewickley, Uniontown, Waynesburg. The Dunkard or Lower Permian has been divided into the Washington and the Greene groups. The Washington has been divided into four members, known as Basal, Lower, Middle, and Upper Washington, each 100 feet or more in thickness. The Greene has been divided into nine members, as follows: Donley, Tenmile, Fish Creek, Hostetter, Nineveh, unnamed, Gilmore, Windy Gap, Proctor. In the last column of the table following are given the various strata that have previously been named, with the names previously used in parenthesis. If no name is given in parenthesis in the last column it is to be understood that the member name is applied to it.

In place of the multitude of names given in the last column it is proposed that the strata there listed shall be given either numbers or names using the formation name. For example: the Ames member today contains the followng names applied to different minor beds within or composing it; Harlem, Ames, Skelley, Grafton, Duquesne, Federal Hill, Birmingham, and West Milford. It is proposed to substitute for all of these names the one name Ames, and to use numbers for the various beds of the member, so that the Harlem coal will be 1st coal, the Harlem rider, 2nd coal, the Duquesne coal 3rd coal, Federal Hill 4th coal, and Milford coal 5th coal of the Ames member; or the name may be used Ames coal 1, Ames coal 2, etc., or if one prefers, the d which for stands Ames may be used and

Table of Members and Named Beds in the "Coal Measures" of Pennsylvania.

Age	Period (System)	Series	Group	Members	Beds (with names) *Carry member names
CARBONIFEROUS	8 Eighth or Upper Carboniferous (Permian)	Lower Permian (Dunkard)	Cg Group 82 (Greene) 650′–900′	i (Proctor) 40′–115′	Sandstone,* etc.
				h (Windy Gap) 40′-140′	Limestone (xiv). Coal* (±1,050′ above Waynesburg coal)
				g (Gilmore) 57′–110′	Sandstone* Coal*
				f 90′–117′	Red shale and thin limestone
				e (Nineveh) 90′-110′	2 Sandstone 2 Coal (Nineveh A) 1 Coal* 1 Limestone (X)
				d (Hostetter) 70′-100′	Coal*
				c Fish Creek 100′	Sandstone Coal* (and Dunkard)
				b Ten Mile 100′–135′	Limestone (Prosperity) Coal* (and Sparta)
				a Donley 45′–75′	Limestone*
			Cw Group 81 (Washington) 250′–340′	d (Up. Wash.) 110′–120′	2 Coal* 2 Limestone* (670′–710′ above Pittsburgh coal) 1 Limestone (Jollytown) 1 Coal (Jollytown)
				c (Mid. Wash.) 100′–140′	2 Limestone* 2 Coal (Washington A) 1 Sandstone (Marietta) 1 Limestone (Ill. or Blacksville)
				b (Low. Wash.) 60′	2 Limestone* 2 Coal (Washington) 1 Sandstone (Washington) 1 Coal (Little Washington)
				a (Basal Wash.) 80′-120′	2 Coal (Waynesburg B) 2 Limestone (Ia or Calvin Run) 1 Coal (Waynesburg A) 1 Limestone (Mt. Morris) 1 Sandstone (Waynesburg) 1 Shale (Cassville)
	Seventh or Middle Carboniferous (Penn.)	Upper Pennsylvanian	Cm Group 79 (Monongahela) 230′–400′	e (Waynesburg) 60′-75′	2 Coal* 2 Iron ore 2 Sandstone (Brownsville) 1 Coal (Little Waynesburg) 1 Limestone*
				d (Uniontown) 50′-100′	Sandstone* Coal* Limestone* (top of Benwood)
				c (Sewickley) 50′-100′	2 Limestone (Bulgar) 1 Limestone (Dinsmore) 1 Sandstone* 1 Coal* (Meigs Cr. & Mapleton)
				b (Redstone) 30′-80′	2 Limestone (Fishpot) 1 Coal* (Pomeroy) 1 Limestone*
				a (Pittsburgh) 30′-80′	2 Sandstone* 2 Coal (Pittsburgh rider) 1 Coal*

Table of Members and Named Beds in the "Coal Measures" of Pennsylvania.—Continued

Age	Period (System)	Series	Group	Members	Beds (with names) *Carry member names
CARBONIFEROUS	7 Seventh Period or Middle Carboniferous (Pennsylvanian)	Upper Pennsylvanian	Cc Group 78 (Conemaugh)	i (Little Pittsburgh) 70′	2 Coal (Morgantown) 2 Limestone (Upper Pittsburgh) 1 Sandstone (Lower Pittsburgh) 1 Coal* 1 Limestone (Lower Pittsburgh)
				h (Connellsville) 75′	4 Coal (2nd Little Pittsburgh) 3 Coal (3rd Little Pittsburgh) 2 Limestone (Summerfield) 2 Red beds* 2 Sandstone* 2 Coal (Franklin rider) 1 Coal (Franklin)
				g (Lonaconing) 135′	6 Coal* (Upper bench) 5 Coal* (Lower bench) 4 Sandstone (Hoffman) 4 Coal (Upper Hoffman) 3 Coal (Middle Hoffman) 2 Limestone (Hoffman) 2 Coal (Lower Hoffman) 1 Sandstone (Claysville) 1 Coal (Little Clarksburg)
				f (Morgantown) 85′	5 Limestone (Upper Clarksburg) 5 Red beds (Upper Clarksburg) 4 Coal (Upper Clarysville) 3 Coal (Lower Clarysville) 3 Red beds (Lower Clarysville) 2 Limestone (Lower Clarksburg) 2 Sandstone* 2 Red beds* 2 Coal (Wellersburg rider) 1 Coal (Wellersburg)
				e (Barton) 70′	2 Limestone (Wellersburg) 2 Coal* rider 1 Sandstone* 1 Coal* 1 Limestone*
				d (Ames) 110′	5 Coal (West Milford) 4 Sandstone (Up. Grafton) 4 Red bed (Birmingham) 4 Coal (Federal Hill) 3 Coal (Duquesne) 2 Sandstone (Lower Grafton) 2 Limestone (Skelley-Upper Ames) 2 Coal (Harlem rider) 1 Red bed* 1 Limestone* 1 Coal (Harlem)
				c (Saltsburg) 110′	4 Limestone (Ewing) 4 Sandstone (Jane Lew) 4 Red beds (Pittsburgh) 3 Sandstone* 3 Limestone (Portersville)

Table of Members and Named Beds in the "Coal Measures" of Pennsylvania.—Continued

Age	Period (System)	Series	Group	Members	Beds (with names) *Carry member names
CARBONIFEROUS (Cont.)	7 Seventh Period: Middle Carboniferous (Pennsylvanian)	Upper Pennsylvanian (Cont.)	Ccm	c (Saltsburg) Cont.	2 Coal (Bakerstown) 2 Limestone (Albright) 1 Red bed (Cambridge) 1 Limestone (Cambridge-Woods Run) 1 Shale (Friendsville) 1 Sandstone (Thomas) 1 Coal (Thomas, Low. Bakerstown)
			Group 78 (Conemaugh)	b (Buffalo) 140′	2 Limestone (Pine Cr.-Thomas) 2 Red bed (Meyersdale) 2 Sandstone* 2 Coal (Brush Creek rider) 1 Red bed (Brush Creek) 1 Limestone (Brush Creek) 1 Coal (Brush Creek, Gallitzin)
				a (Mahoning) 120′	4 Limestone (Irondale) 4 Sandstone* Upper (Corinth) 3 Coal* 3 Clay (Thornton) 3 Iron ore (Johnstown) 3 Red bed* 3 Limestone* 2 Flint clay (Wehrum) 2 Sandstone* Lower 2 Coal (Piedmont) 1 Coal (Upper Freeport rider)
			Ca	c (Freeport) 100′	2 Coal and clay* Upper 2 Limestone* 2 Flint clay (Bolivar) 2 Sandstone (Butler) 1 Coal and clay* Lower 1 Limestone* Lower 1 Sandstone*
			Group 77 (Allegheny)	b (Kittanning) 100′	7 Coal* Upper 7 Limestone (Johnstown) 6 Fire clay (Hardman) 6 Coal 5 Coal (Gorman, Piney Mt.) 4 Sandstone (Westernport) 4 Coal and clay* Middle 3 Coal 2 Sandstone (Ellerslie) 2 Coal (Bens Creek,—L. Kit. rider) 1 Coal and clay* Lower
				a (Clarion) 60′-150′	5 Flint clay (Clarion) 5 Coal (Ferriferous) 4 Iron ore (Buhrstone) 4 Limestone (Vanport or Ferriferous) 4 Coal (Scrubgrass) 3 Sandstone* 3 Coal* (Upper) 2 Coal* (Lower) 1 Coal and clay (Brookville)

Table of Members and Named Beds in the "Coal Measures" of Pennsylvania.—Continued

Age	Period (System)	Series	Group	Members	Beds (with names) *Carry member name
CARBONIFEROUS (Cont.)	Seventh Period: (Pennsylvanian) (Cont.)	Middle Pennsylvanian (Pottsville)	g77 Group 76: Upper Kanawha	b (Homewood) 50′-100′	Sandstone*
				a (Mercer) 50′-0′	3 Shale* Upper 3 Limestone* Upper 3 Coal and clay* Upper 2 Coal* Middle 1 Limestone* Lower 1 Coal* Lower
			Group 75: Middle Kanawha	b (Connoquenessing) 100′ a (Sharon	2 Sandstone* Upper 1 Shale (Quakertown) 1 Coal (Quakertown) 1 Sandstone* Lower 1 Coal*
			Group 74: Lower Kanawha	a (Sharon) 0′-60′	Sandstone* (Olean)

the corresponding coals called coal d1, d2, d3, and d4, or using the designation 78 which stands for Conemaugh, these coals could be designated as coals 78d1, 78d2, etc., and the same method may be used for designating limestone, sandstone, red beds, or shales.

The table above is believed to set forth by name in correct relative position nearly all of the coals, limestones, sandstones, shales, and clays of the Coal Measures of Pennsylvania that have in the past been deemed worthy of naming, including a few coals not yet named. The names given are believed to be those in most common use.

The rocks of the Coal Measures differ from most other rocks in that extensive mining of the coals and clays and quarrying of the sandstones and limestones in the coal fields has given a very large number of people a certain familiarity with the beds by name, probably much more so than would be found true of any other series of rocks. It is believed proper, therefore, in such a volume as this to use the names of individual beds rather freely.

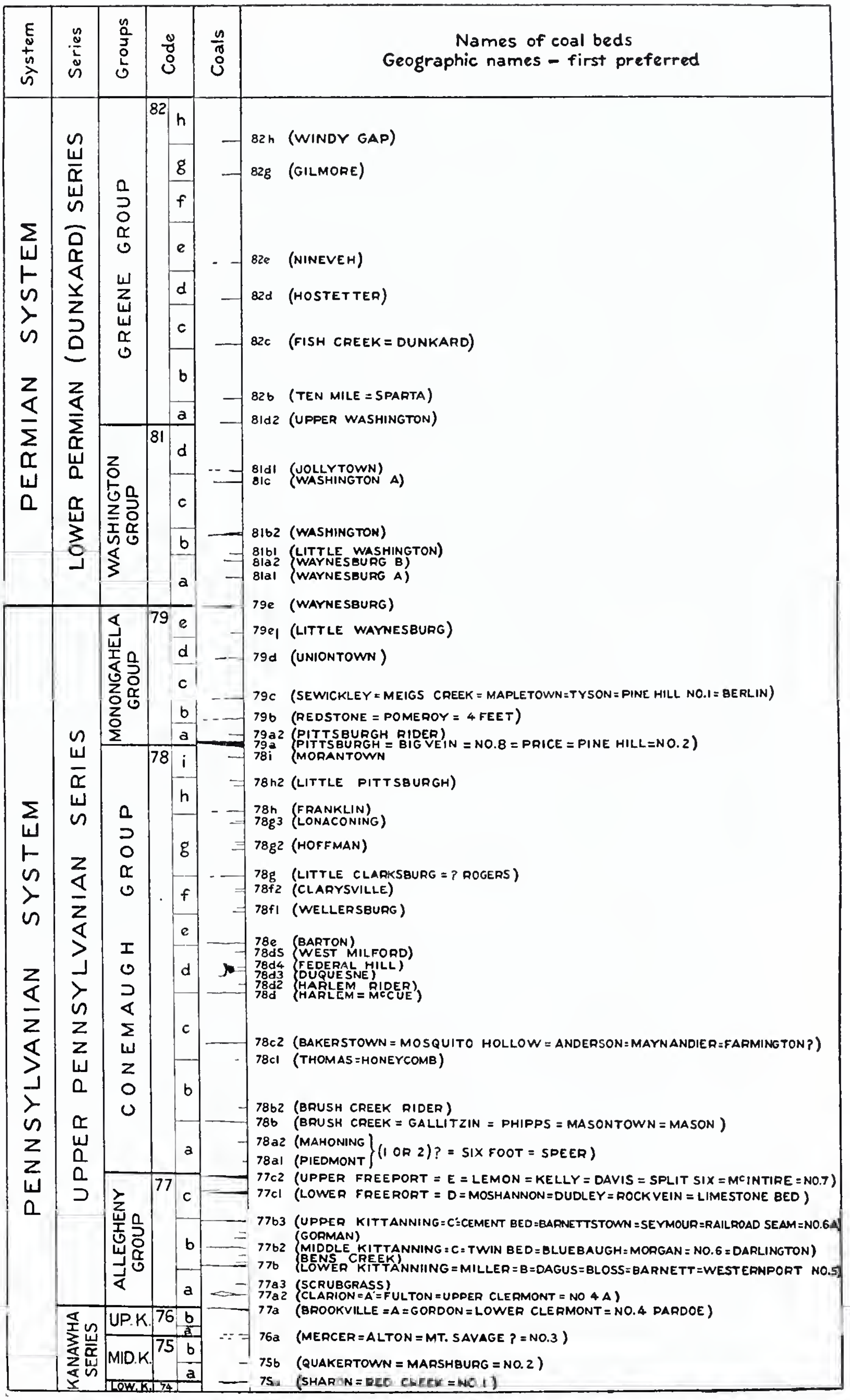


Fig. 11. Graphic section of bituminous coal beds of Pennsylvania.

Coal Beds Briefly Characterized

Fig. 11 shows graphically the bituminous coal beds of the State in their relative position. The thickness of each as drawn is intended to convey some idea of its importance and extent.

There appears to be coal at no less than 68 horizons. Were all of the facts known it is probable that the number would be increased.

In the following paragraphs the several coal beds are taken up in turn and briefly described, beginning at the top.

UPPER CARBONIFEROUS OR PERMIAN SYSTEM.

Lower Permian or Dunkard Series.

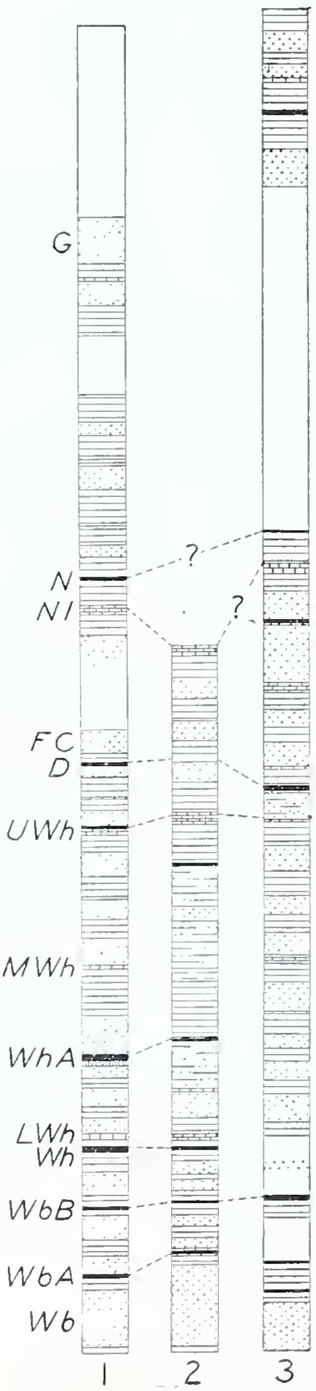


Fig. 12. Selected sections to illustrate the stratigraphy of the Dunkard rocks.

1. Section from Dunkard Creek, Greene County, Pa.
2. Section from Colvins Run, Greene County, Pa.
3. Section from Aleppo township, Greene County, Pa.

Sections from U. S. G. S. Bull. 65, pp. 22-24

Scale—1 inch=200 feet

G Gilmore sandstone

N Nineveh coal

N1 Nineveh limestone

FC Fish Creek sandstone

D Dunkard coal

UWh Upper Washington limestone

MWh Middle Washington limestone

WhA Washington A coal

LWh Little Washington limestone

Wh Washington coal

WbB Waynesbrug B coal

WbA Waynesburg A coal

Wb Waynesburg sandstone

Dunkard Series.

Thickness, character and extent. The name "Dunkard" or "Dunkard Creek" series was applied by I. C. White in 1891 to the deposits of this age from their fine exposures along Dunkard Creek in Greene County. A thickness of 1,100 to 1,200 feet of these rocks remains, confined almost entirely to Greene and Washington counties. In general the series consists of shale, shaly sandstone, limestone, and coal. The limestone and coal are more important in the lower part of the series and in the northeastern part of the area covered by the series, though the coal beds are rarely workable. Going southward all of the limestones but one, the Nineveh, disappear before reaching Jackson County, West Virginia. Red shales are abundant in the upper part of the section in West Virginia and in Greene County, but disappear toward Washington County. Some of the sandstones associated with the red shales in the upper part of the section are very massive, though fine grained. The rocks dip to the southwest, so that their greatest thickness in the State is in the southwest corner, near the headwaters of Dunkard Creek. The series is divided into two groups, the Greene above, extending down to the top of the Upper Washington limestone, and the Washington group below, extending down to the top of the Waynesburg coal.

COAL BEDS OF THE GREENE GROUP (Cg).

Coal 82h (Windy Gap). This coal, the highest stratigraphically in the Appalachian region, is about 1,050 feet above the Waynesburg coal. It is known only from blossoms. It is associated with black shale containing cypris (a small, fresh water bivalve shell).

Coal 82e (Nineveh). This is the uppermost of a series of five thin coals, sometimes known as the Bellton coal group, from their fine exposure at Bellton, W. Va. It is seldom over a foot in thickness, but is highly prized locally for smithing.

Coal 82d (Hostetter). This coal, from 1 to 15 inches thick and rather pure, is 130 feet below the Nineveh at Bellton.

Coal 82c (Dunkard). This coal comes within 20 feet below the Fish Creek sandstone. It is a thin, double coal, usually not more than 12 to 15 inches thick, but almost invariably double. At Deep Valley the parting thickens up to 5 feet. The roof shales contain well preserved fossil plants.

Coal 82b (Tenmile or Sparta). This coal has a thickness of 1 to 3 feet or over. It contains thin partings, and occurs between a black shale and a shaly limestone.

COALS OF THE WASHINGTON GROUP (Cw).

Coal 81d2 (Upper Washington). This coal lies immediately on top of the Upper Washington limestone, imbedded in the black bituminous shale which generally overlies that limestone. The shale is uniformly present, but the coal is variable, its maximum thickness being not more than 14 inches, including shale and clay partings.

Coal 81d1 (Jollytown). This coal is thin and occurs about 40 to 50 feet below the Upper Washington limestone, which is, next to the Waynesburg sandstone, the most conspicuous member of the Dunkard series.

Coal 81c (Washington A). This is an impure coal, locally 4 to 5 feet thick, occurring 70 to 80 feet above the Washington coal. It is commonly shaly, and in places is represented only by a bituminous shale.

Coal 81b2 (Washington). This is the most widely mineable coal in the Dunkard group. It occurs immediately below the Lower Washington limestone. It is always separated into two or three benches by shale partings, which greatly reduce its value. It locally attains a thickness of 8 or 10 feet, of which only the bottom 2 or 3 feet are pure or merchantable. The upper part is generally shaly and high in ash.

Coal 81b1 (Little Washington). This is a thin, unimportant coal occurring just under the Washington sandstone in Washington County but seldom seen elsewhere.

Coal 81a2 (Waynesburg B). This coal is somewhat more persistent than the last. It occurs about 45 feet below the Washington coal and has a thickness of 1 to 2 feet though usually less.

Coal 81a1 (Waynesburg A). This coal is 60 to 80 feet above the Waynesburg coal and immediately beneath the Colvin Run limestone. It attains a thickness of 3 feet to 4 feet 6 inches, but is commonly shaly and worthless.

PENNSYLVANIAN SYSTEM.

Pittsburgh Series.

Monongahela Group. (Cm) or Group 79.

Thickness, character, and extent. This group extends from the top of the Waynesburg coal down to the base of the Pittsbugh coal, or technically, the base of the clay below the coal. Its thickness ranges from 200 feet along the western outcrop in Ohio to 380 feet on the Monongahela River. It is said to be over 400 feet thick in borings in West Virginia. In Pennsylvania it has somewhat narrower limits. The group is confined to the southwest part of the State, occupying nearly the whole of Washington and Green coun-

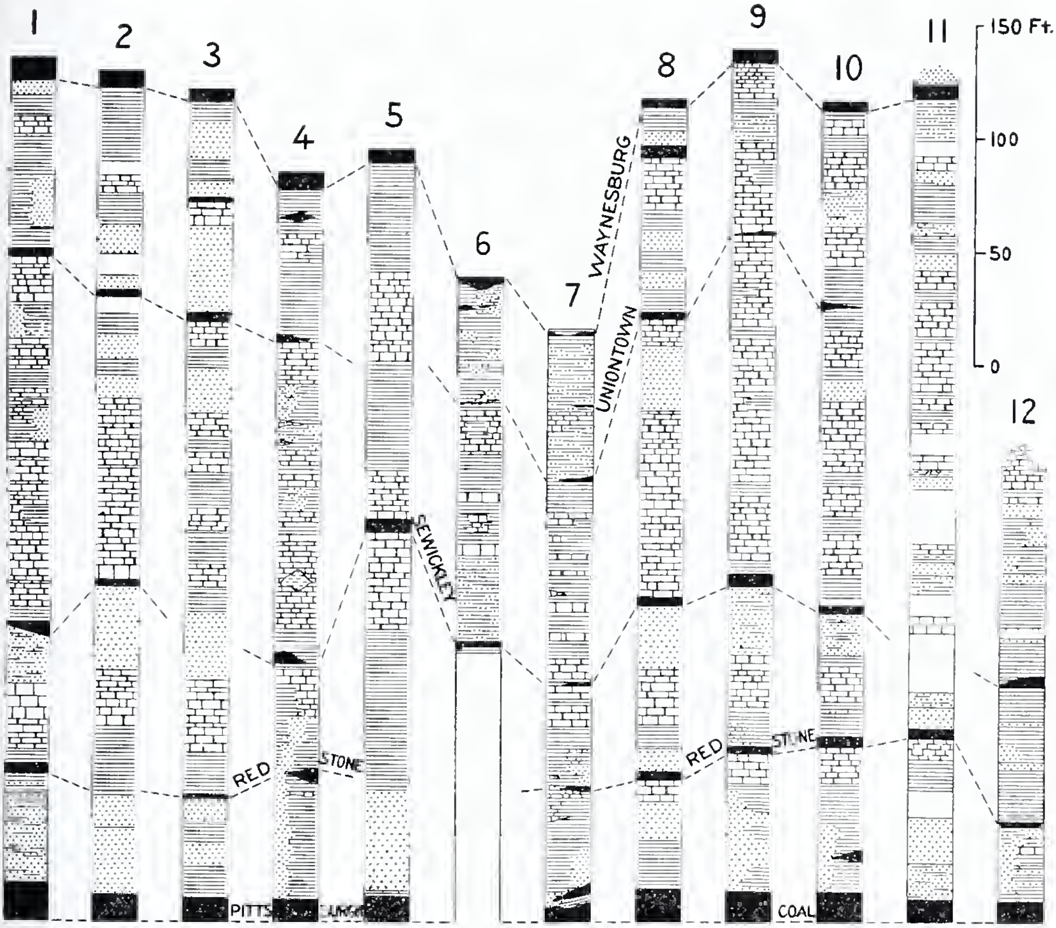


Fig. 13. Selected sections to illustrate the stratigraphy of the Monongahela group.

1. Section in Greene County by R. W. Stone, U. S. G. S. Waynesburg folio.
2. Section at Rice's Landing, Greene County, by I. C White, U. S. G S. Bull. 65, p. 45.
3. Section at West Brownsville, by I. C. White, U. S. G. S. Bull. 65, p. 45.
4. General section, Eastern Washington County, by F. G. Clapp, U. S. G. S. Amity folio.
5. Section 1½ miles northwest of Deemston, Washington County, by F. G. Clapp, U. S. G. S., Amity folio.
6. Section in western Washington County, by M. J. Munn, U. S. G. S. Claysville folio.
7. General section in northern Washington County, by M. J. Munn, U. S. G. S., Burgettstown folio.
8. General section, Fayette & Westmoreland Counties, by J. J. Stevenson, 2nd Geol. Surv. of Pa., KK, p. 31.
9. General section, Fayette County, by M. R. Campbell, U. S. G. S., Masontown-Uniontown folio.
10. General section, Westmoreland County, by M. R. Campbell, Brownsville-Connellsville folio.
11. General section at Herminie, Westmoreland County, by M. E. Johnson.
12. General section, Armstrong County, by R. W. Stone, U. S. G. S., Elders Ridge folio.

ties, a considerable portion of Allegheny, Fayette, and Westmoreland counties, and small isolated areas in Somerset and Indiana counties.

In Pennsylvania limestones make up fully one-half the thickness of the group, and in the same area the group contains at least six distinct coal beds, three of which are valuable. To the southward

or southwestward the limestones disappear and all of the coals but the Pittsburgh bed. In place of the limestones appear red shales, which on the Kanawha make up about one-fourth of the group. The Pittsburgh coal, at the base of the group, is the main source of interest and value in this group, though some of the other beds are locally of value.

COALS OF THE MONONGAHELA GROUP (Group 79).

Coal 79e (Waynesburg.) This bed, which forms the top of the group, is almost everywhere double, from 5 to 10 feet thick, of which from one-fourth to one-half consists of clay partings.

In the Uniontown syncline this coal has an average thickness of 3 feet 6 inches. West of this it has a much greater thickness but is usually split up with clay partings. Single benches range from 2 feet to 4 feet 6 inches at the best. Often by the removal of less than 1 foot of clay 5 to 6 feet of coal can be obtained. On account of this thickness—often over 10 feet—this coal makes very prominent showing in the roads and elsewhere, but its high ash and sulphur and numerous clay partings confine its operation to small mines as long as the Pittsburgh bed remains. A sample from Greene County showed: 12.81 per cent ash; 3.77 per cent sulphur. It has its best development in Greene County where it yields 5 to 6 feet of coal. Before the discovery of oil and gas in that county this bed was quite extensively mined around Waynesburg for the local trade. The best sections there show:

	Feet
Coal	2
Clay	1
Coal	3
Total	6

It is still mined to some extent for local use. At this point it carries about 30 per cent fixed carbon, 32 per cent volatile matter, 1.2 to 3 per cent sulphur, 11 to 13 per cent ash.

In Washington County the Waynesburg coal ranges in thickness from 0 to 7 feet. Where thick the coal usually is in three benches, the middle one 2 to 3 feet thick. It is there a hard, block coal of no value for coke. As shown by analysis, it has about 46 per cent fixed carbon, 32 per cent volatile matter, 10 to 20 per cent ash, 2 to 5 per cent sulphur, and 2 to 3 per cent moisture.

Coal 79c1 (Little Waynesburg). This coal is from 25 to 40 feet below the Waynesburg coal and has a thickness of only a foot or less or is represented only by bituminous shale.

Coal 79d (Uniontown). This coal lies 80 to 100 feet below the Waynesburg coal. In Fayette and Washington counties it has a thickness of 3 feet or less. Southward and southwestward it thins away to a mixture of coal and black shale containing fish remains. At Uniontown it has a thickness of 3 feet 2 inches, in the Leith shaft of 4 feet 6 inches; in Greene County it rarely exceeds 12 inches. In most shaft sections it is thin or wanting.

Coal 79c (Sewickley). This coal which is unimportant in northwestern Washington County, being only 4 to 8 inches thick, becomes 5 to 6 feet thick in southeastern Greene County and in Fayette County. It measures 5 feet at Mapletown, Fairchance, Brownfield, Yorks Run, near Smithfield, and at Grays Landing.

Coal 79b (Redstone). A small coal is found locally above the Pittsburgh bed, the interval ranging from 30 to 85 feet. In parts of Westmoreland, Fayette and Somerset counties it reaches a thickness of 3 to 5 feet. In general it is thin or wanting, or represented only by a few inches of black shale.

Coal 79a (Pittsburgh). The Pittsburgh coal is the best known and at the present time the most valuable member of all the rocks in southwestern Pennsylvania. Indeed it is probably true that up to the present time the Pittsburgh coal bed has yielded a larger gross value of product than any other individual geological deposit the world over. The number of metal deposits that have yielded over $300,000,000 are very few. Yet the Pittsburgh coal bed in recent years has yielded from $150,000,000 to $300,000,000 worth of coal a year. It may be doubted if the ultimate tonnage will be as large as from some other beds of coal, as for example, the No. 5 bed of the Illinois field.

Estimated original acreage and recoverable tonnage of Pittsburgh coal bed.

	Original area Sq. mi.	Thickness feet	Estimated tonnage
Pennsylvania	2,077	7	8,130,000,000
West Virginia	2,214	5	9,750,000,000
Ohio	1,410	5	4,666,000,000
Maryland	28	14?	100,000,000
Total	5,729		22,646,000,000

The production of coal from the Pittsburgh bed to date (1926) is estimated as follows:

Production of Pittsburgh coal to date in short tons.

Pennsylvania	2,500,000,000
West Virginia	400,000,000
Ohio	400,000,000
Maryland	175,000,000
Total	3,475,000,000

In the Pennsylvania part of this field the Pittsburgh bed seems to be almost, if not quite persistent. In parts of West Virginia and Ohio the bed is thin or wanting. The Pittsburgh bed appears to have been laid down on a surface rendered slightly irregular by erosion. This can be seen locally in outcrop exposures (Fig. 14), and is encountered in mining as an irregularity in the floor, as shown in Fig. 15.

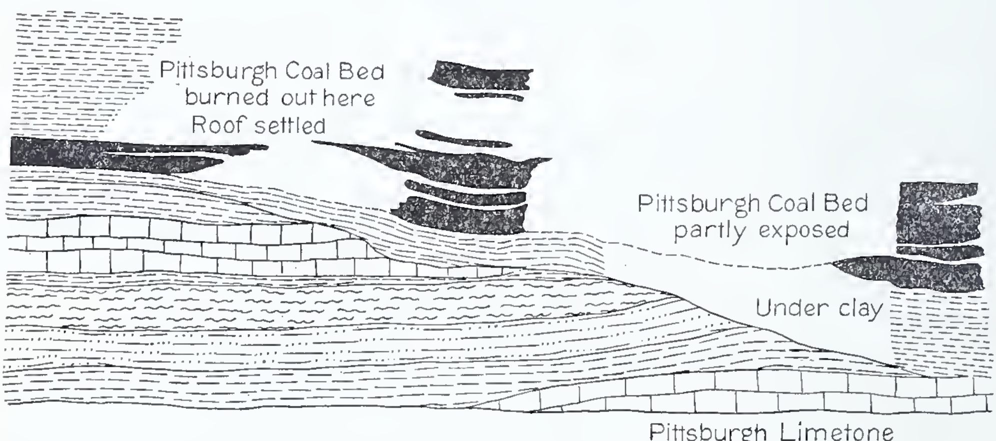


Fig. 14. Sketch showing non-conformity below Pittsburgh coal as seen at Woodville, Allegheny County. The coal at the left has been on fire and nearly burned out. Scale: 1 inch = 20 feet nearly.

The figure shows a small area south of Carnegie in Allegheny County. The present position of the base of the Pittsburgh bed is shown by contours. The original shape of the surface upon which the Pittsburgh was laid down could be obtained by taking the difference between the theoretic surface showing the structure due to folding and the actual surface of the base of the coal. The decreased interval from the Pittsburgh coal to the Ames limestone in Ohio may be an expression of this same unconformity. This interval, which is practically 300 feet at Pittsburgh, decreases to 219 feet at Steubenville, Ohio, and to 150 feet in Guernsey County, Ohio.

The Pittsburgh coal in its ordinary condition, as seen in most of the area underlain by it in Pennsylvania and Ohio, is double, con-

sisting, first, of a "roof" division, which varies from solid coal to laminated coal and clay, and in thickness from 1 to 12 feet. In parts of the field, as near Burgettstown, the roof division is found

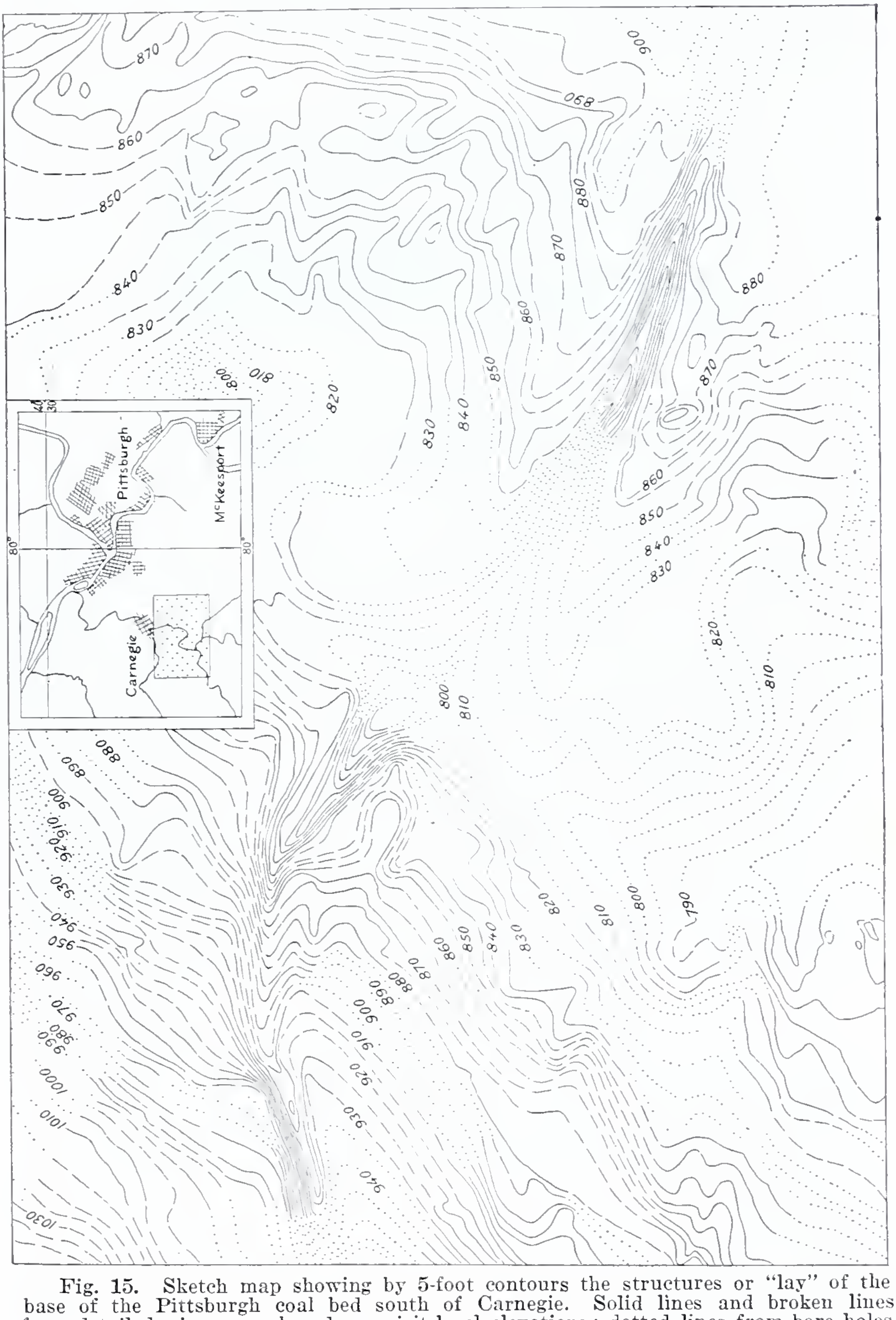


Fig. 15. Sketch map showing by 5-foot contours the structures or "lay" of the base of the Pittsburgh coal bed south of Carnegie. Solid lines and broken lines from detailed mine maps based on spirit level elevations; dotted lines from bore holes and surface geology. Horizontal scale: 1 inch = 4,000 feet; contour interval, 5 feet.

15 or 20 feet above the main bench. Its best development is at the north as in northern Washington County where it locally is 5 to 6 feet thick. In general it is thin toward the south. In northern West Virginia it is usually thin or lacking. The roof division is everywhere characterized by its clay partings. These are often extremely irregular so that detailed measurements a few yards apart may give quite dissimilar sections. See Fig. 16.

Fig. 16. Sketch of part of outcrop of the upper division of the Pittsburgh coal near Woodside; to illustrate the irregular character of the clay partings.

In places the clay partings are more regular. In some sections the division is less than one-half coal; in others the clay forms only one thin parting. In general the roof division has been considered worthless and left up in mining. It is quite possible that in time it will be mined for use at the mine or in the production of power. The roof coal is worked in but few places. The partings in the roof division may be clay, shale, or bone.

The main clay or "over clay" is commonly an impure clay, locally with coal streaks near the base. It averages a little under 1 foot in thickness, ranging from a few inches to 2 feet thick. Below that is the "main" coal. This is divided by thin clay partings into four benches called the breast, bearing-in, brick, and bottom coal. The different benches differ in quality and character.

Divisions of the Pittsburgh coal.

	Ft.	In.
Roof division	2- 8	
Main or over-clay, about	1	
Breast or main bench, often with parting in the middle	2-10	
Parting		$\frac{1}{4}$
Bearing-in bench		4- 6
Parting		$\frac{1}{4}$
Brick bench, about	1	
Parting, often absent or thin.		
Bottom bench		12-20

The breast or main coal bench is the most valuable and important part of the bed. It varies in thickness from 2 feet in Ohio to 3 feet at Pittsburgh, 6 feet at Brownsville, and up to as much as 10 feet in the Georges Creek region of Maryland. The top of the breast coal for a few inches is harder than the rest, often cannelly and frequently bony. There is occasionally a thin parting near the middle of this bench, especially toward the northwest. The bearing-in bench, which in hand mining is the bed mined in, is a remarkably regular feature of the bed, especially with its two bounding thin shale partings above and below. The partings are usually mottled gray, from $\frac{1}{4}$ inch to 1 inch thick. To the south they become bony and less conspicuous. The coal in this bench is bright, pure coal from 3 to 6 inches thick. The brick coal, named from the brick-like shape of the blocks into which it mines, is from 0 to 1 foot thick. The parting between this and the bottom bench is often inconspicuous and sometimes lacking.

The bottom bench is 12 inches to 2 feet 1 inch thick and usually impure. It is probable that where the coal is thickened in erosion channels, the increase is in this bottom bench. This is often left on account of its impurities. It could be utilized with the roof coal if that should ever be used.

The Pittsburgh coal bed, not including the roof coal, has a thickness near Pittsburgh of about 5 feet. This increases southward so that in the southwestern part of the State it averages 7 feet, ranging from 6 to 8 feet over much of Greene and Fayette counties.

The Pittsburgh bed averages about 7 feet thick in Pennsylvania, 5 feet in Ohio and West Virginia, and up to 22 feet in Maryland and Mineral County, West Virginia, where it is nearly all mined out.

Fig. 17. Sections of the Pittsburgh coal bed in Pennsylvania

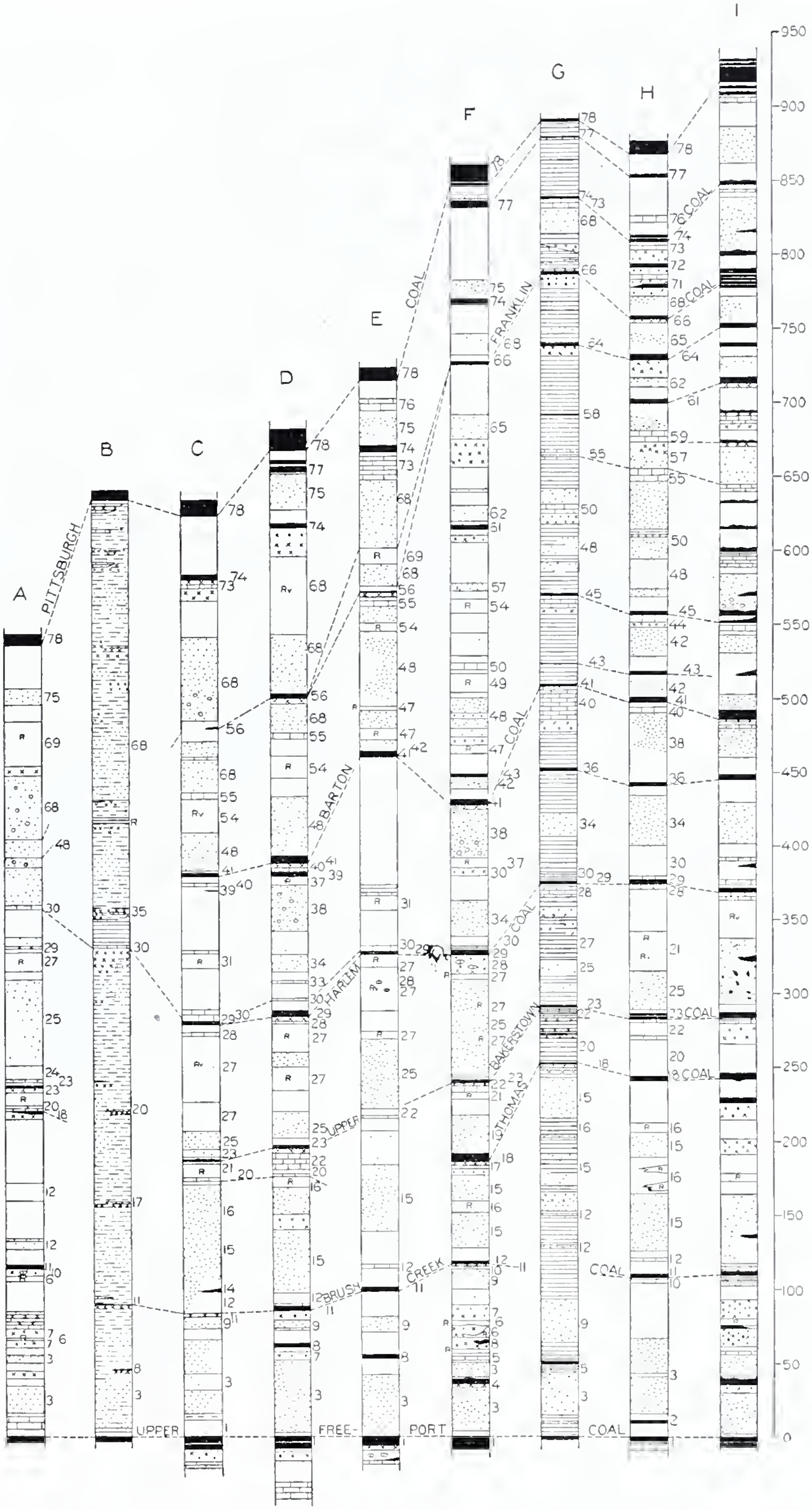


Fig. 18. Selected sections to illustrate the stratigraphy of the Conemough group.

A. Section at Wheeling, West Virginia, by I. C. White.
B. Generalized section in Pittsburgh district, by M. E. Johnson.
C. Section at Morgantown, West Virginia, by I. C. White.
D. Section at Preston, West Virginia.
E. Section at Latrobe by M. R. Campbell and Percy Raymond.
F. Section in Upper Potomac basin, Md., by C. K. Swartz.
G. Generalized section in Somerset Co., by J. D. Sisler.
H. Section in Castleman basin, Md., by C. K. Swartz.
I. Generalized section in Georges Creek Basin, Md., by C. K. Swartz.

Conemaugh Group (Group 78).

In order to bring out more fully the stratigraphy of the lower part of the Conemaugh a number of partial sections are added.

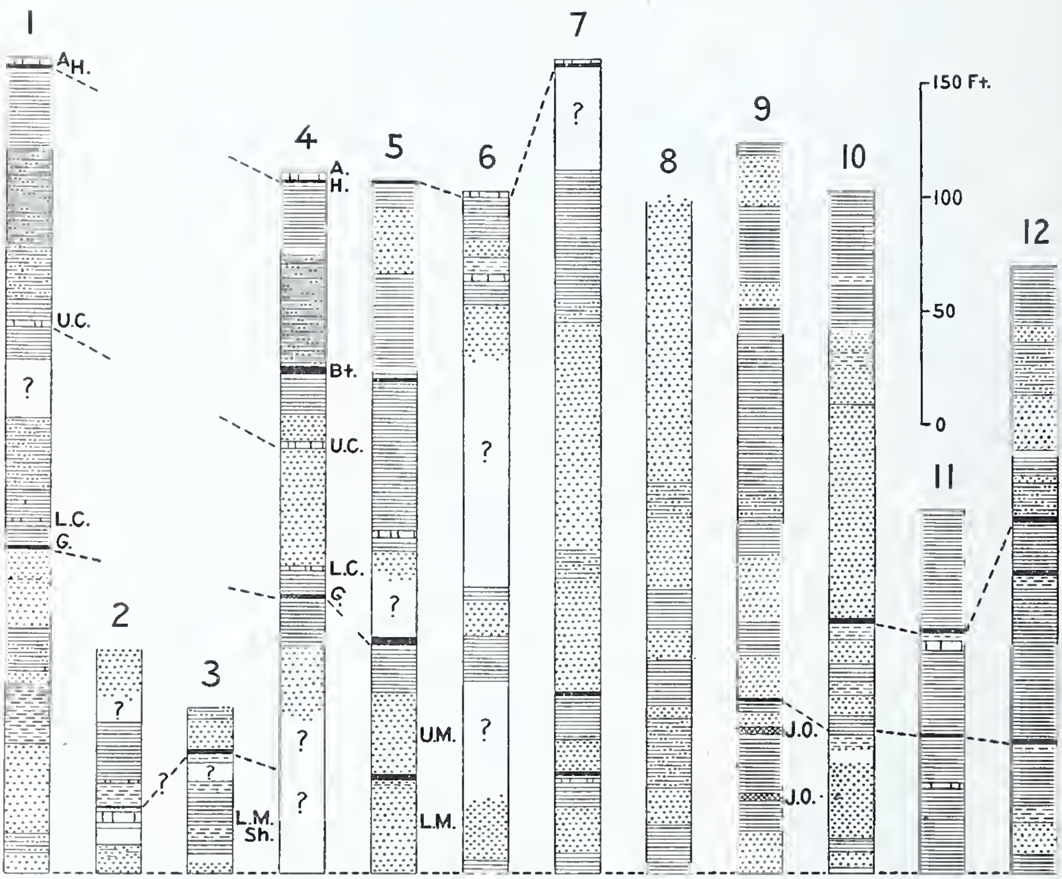


Fig. 19. Selected sections from the lower half of Conemaugh group, aligned on the top of the Upper Freeport coal.

1. Diamond drill hole at Sewickley, Allegheny County (U. S. G. S. Bull. 65, p. 73).
2. Generalized section for Beaver quadrangle, (U. S. G. S. Bull. 286, p. 16).
3. General section of Pittsburgh region (U. S. G. S. Bull. 65, p. 72).
4. Dunbar Creek, Fayette County (2nd Geol. Sur. of Pa., Rep. KKK, p. 182).
5. Section at Ligonier, Westmoreland County (same as last, p. 129).
6. Armstrong County, (compiled) (2nd Geol. Surv. of Pa., Rep. 5H, p. 5).
7. Section near Saltsburg (U. S. G. S. Folio 110, p. 8).
8. Diamond drill hole, Jefferson County.
9. Johnstown section (2nd Geol. Surv. of Pa., Rep. HH, p. 97).
10. Cresson shaft (2nd Geol. Surv. of Pa., Summary Rept. p. 2412).
11. Diamond drill hole, northeast Cambria County.
12. Diamond drill hole, northwest Cambria County.

Thickness, character, and extent. The Conemaugh group extends from the base of the Pittsburgh coal to the top of the Upper Freeport coal. It is 500 to 950 feet thick, decreasing westward to 400

feet or less in Ohio, and reaching its greatest thickness at the east in Somerset County and in the Georges Creek basin in Maryland. The rocks consist of shales, sandstones, conglomerates, thin limestones, and thin coals. The group is distinguished from those above and below by the relative unimportance of the coal beds, from 25 to 30 in number, and the abundance of red shale. The sandstones of the Conemaugh are locally thicker than in the formations above or below, but taken as a whole the formation is shaly in character.

The thinning from east to west appears to be due mainly to the thinning out of members 5, 6, and 7 of the group. These members have a thickness in the Georges Creek basin of 300 feet. Members 5 and 7 (Barton and Lonaconing) disappear westward before reaching the Latrobe syncline. Member 6 (Morgantown) thins westward and disappears only west of Wheeling, West Virginia.

The correspondence of the various parts of the Conemaugh has been determined both by tracing the beds on the surface and by studying the fossil shells in certain limestones and other beds. The fossils in three of these beds have proved so distinct and characteristic that it is thought they have been traced from Ohio to Maryland with some degree of certainty. These three faunas are found in the Brush Creek, Cambridge or Woods Run, and Ames limestones, or in the associated shales. The fossil shells in the Ames limestone are in particular *Ambocoelia planoconvexa*, *Chonetes granulifer*, (typical form), and *Derbya crassa*. At many places a large part of the limestone is composed of these three shells. At the Cambridge horizon the characteristic species are *Productus cora*, *Pustula nebraskaensis*, and *Derbya crassa*. The Brush Creek limestone is particularly rich in *Chonetes verneuilianus*, and *Bulimorpha nitidula*. Other less characteristic faunas occur at other horizons. Some of the Conemaugh coals have a fairly persistent workable thickness in Somerset County and to the southward in Maryland and West Virginia. The unconformity at the top of the group has been mentioned before.

COALS OF THE CONEMAUGH GROUP

Coal 78h2 (Little Pittsburgh). This coal is a thin, persistent bed, usually only 1 or 2 feet thick, lying 25 to 60 feet below the Pittsburgh coal. In Somerset County and in Maryland there appear to be locally two coals in this general position, occurring above and below limestone 78i (Upper Pittsburgh). In places one of these coal beds is 3 or 4 feet thick, and is mined locally.

Coal 78h1 (Little Pittsburgh). This coal has been observed locally 25 feet above coal 78h. Near Clarysville, Md. it is 14 inches thick.

Coal 78h (Franklin, Dirty nine foot). While little seen in Pennsylvania this coal is thick in Maryland and West Virginia, where it occurs from 125 to 140 feet below the Pittsburgh coal.

Coals 78g3 (upper & lower) (Lonaconing, upper and lower). These coals, like the last, are more prominent in Maryland and West Virginia than in Pennsylvania. One of these beds in Somerset County, 160 feet below the Pittsburgh bed, is 4 feet thick but very dirty.

Coals 78g2 (Hoffman, upper, middle and lower). Two, or in a few places three, beds of coal are found at this general horizon in the Georges Creek Valley, and possibly in Somerset County, Pennsylvania. Locally the upper bed is over 4 feet thick.

Coal 78g (Little Clarksburg). This is a thin shaly coal from 100 to 125 feet below the Pittsburgh coal in western Pennsylvania. It is commonly not over 1 to 2 feet thick, and high in ash. It is probably this coal that reaches a thickness of 5 to 6 feet around Bavington, Washington County.

Coals 78f2 (Clarysville, upper and lower). These coals occur in the Georges Creek basin, where the upper bed is 277 feet below the Pittsburgh bed. They have no commercial value.

Coals 78f1 (Wellersburg and Wellersburg rider). This coal occurs 60 feet above the Barton coal. It is a thick bed near Wellersburg in Somerset County. It is commonly divided into two benches by a binder 2 to 5 feet thick. The "rider" bed, 1 foot thick, is found 25 feet above the main bed.

Coal 78e (Barton, Four foot, Bakerstown in parts of earlier reports, Elk Lick coal of some reports.) This coal is found 100 to 120 feet above the Ames limestone or Harlem coal. It is extensively mined in the Georges Creek Valley, and it is of local importance at many places in western Pennsylvania. It is 4 feet thick in Somerset County, and is reported as persistent in Westmoreland, Fayette, and Allegheny counties.

Coals 78d4 and 78d5 (Federal Hill and West Milford). Coal 78d4 is a thin but persistent coal found about 75 feet above the Ames limestone. Neither this nor the West Milford coal is of commercial value.

Coal 78d3 (Duquesne). The Duquesne coal is a fairly persistent, thin bed, which occurs from 20 to 40 feet above the Ames limestone in the Pittsburgh region.

Coal 78d (Harlem or Friendsville). This coal is found just below the Ames limestone, which coming about in the middle of the Conemaugh group and characterized by its color and fossils, has been widely used as a key rock. The coal is thin in most areas but reaches a workable thickness of 1 foot 8 inches to 2 feet 6 inches locally.

Coal 78c (Bakerstown, Maynadier, Upper Freeport of early reports on Somerset County and Maryland). This coal, lying 75 to 90 feet below the Ames limestone, is in most areas a thin coal but locally it attains a thickness of 5 feet and has been mined a little commercially. It is from 175 to 290 feet above the Upper Freeport coal, the greater

interval at the east. In Somerset County and in Maryland and eastern West Virginia it is persistently 3 to 4 feet thick, and elsewhere it is workable locally.

Coal 78c1 (Thomas, Three-foot, Honeycomb). This coal is found locally in western Pennsylvania but is not persistent. In Somerset County, in Maryland, and in northeastern West Virginia, however, it becomes a valuable coal, measuring nearly 7 feet near Thomas. In parts of the Maryland coal fields it splits into two parts of which the upper is locally 4 feet thick and mined by itself.

Coal 78b (Gallitzin or Brush Creek). This coal lies about 120 feet above the Upper Freeport coal. It is generally a thin coal, but locally is 2 to 4 feet thick. It is persistent and forms a valuable key rock. Over it commonly occurs a black shale and limestone containing characteristic marine fossils.

Coal 78a2 (Mahoning). This coal is thin or represented only by black shale but appears in many sections widely scattered. It is probably nowhere of commercial value except in the Greensburg area of Pennsylvania. It lies between the upper and lower members of the Mahoning sandstone.

Coal 78a1 (Piedmont) coal. In Maryland and Somerset County is found a coal called the Piedmont or "6-foot coal" occurring a short distance above the Upper Freeport coal. In the paper by Charles K. Swartz, W. Armstrong Price and Harvey Bassler[1] this is placed between the Upper Freeport and Mahoning coal, as shown on sections of the stratigraphy of the Conemaugh (Fig. 18, I). In a later paper the same section is given, but the Mahoning coal of the first report is in the later paper called the Gallitzin coal.[2]

The writer has correlated the Gallitzin coal with the Brush Creek coal all through central Pennsylvania. Attention has already been called to the irregularity in the stratification of the Lower Conemaugh which renders correlations and accurate tracing of beds very difficult. The writer has been strongly inclined to believe that the Piedmont coal would prove to be at the same horizon as the Mahoning, but in view of these uncertainties he has given Professor Swartz's interpretation the benefit of the doubt. In any case the sandstone below the Mahoning coal may not be called the Upper Mahoning as the Mahoning coal certainly belongs between the Upper and Lower Mahoning sandstone.

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[1]Swartz, Charles K., Price, W. Armstrong, and Bassler, Harvey. Coal Measures in Maryland: Geol. Soc. America Bull. Vol. 30, pp. 567-596, 1919.

[2]Swartz, Charles K. and Baker, William A. Jr., Second Report on the Coals of Maryland. Plate 6, Columnar sections in pocket. Baltimore, Maryland, 1920.

Allegheny Group (Group 77).

Fig. 20. Selected sections to illustrate the stratigraphy of the Allegheny group in western Pennsylvania.

1. Generalized section, New Castle quadrangle. (DeWolf).
2. Generalized section, Beaver quadrangle. (Woolsey).
3. Section on Cucumber Creek, Uniontown quadrangle. (Campbell).
4. Generalized section, Kittanning-Rural Valley quadrangle. (Butts).
5. Selected section, Indiana quadrangle. (Richardson).
6. Selected section, Johnstown quadrangle. (Phalen).
7. Generalized section, Ebensburg quadrangle. (Butts).
8. Selected section, Barnesboro quadrangle. (Campbell).
9. Selected section, Patton quadrangle. (Campbell).
10. Generalized section, Punxsutawney quadrangle. (Ashley).
11. Selected section, Curwensville quadrangle. (Ashley).
12. Generalized section, Houtzdale quadrangle. (Ashley).

General character and thickness. The Allegheny group, originally known as the Lower Productive Coal Measures, yields about 50 per cent of the bituminous coal mined in Pennsylvania. It forms a broad but irregular belt or fringe all around the coal field in Pennsylvania and is brought up within the field by the prominent anticlines. This group is usually distinguished from the Conemaugh above by the presence in it of several commercially valuable coal beds, and from the underlying group by the smaller amount of sandstone it contains. It is commonly delimited as extending from the top of the Upper Freeport coal to the base of the Brookville under clay. In places both of these coals are thin or wanting. Where thin they may be confused with other thin coals above or below them, making it difficult to draw the boundaries. This difficulty is increased when one or both of the bounding coals are absent, particularly if the coals at the nearest adjacent horizons within the group are also absent, as is true in places. In such places it is often possible to measure up or down from some characteristic strata within the group and determine the approximate position of the boundary. In the eastern part of the field some of the more characteristic strata, such as the limestones, are lacking so that in some areas it is difficult to draw the boundaries of the group with any accuracy.

Recent studies indicate that the Allegheny as described and mapped in the Kittanning, Rural Valley, and in part of the Foxburg-Clarion folios, is in error. The sandstone there called the Clarion sandstone appears to be at the same horizon as the Homewood sandstone on Beaver River, and the Craigsville of that area to be the same as the Brookville coal at Brookville.

In general the group increases in thickness from west to east and the number of coal beds increases in the same direction. Over a considerable area in western Pennsylvania the Vanport limestone makes an excellent key rock. This, coupled with the small number of coal beds, renders fairly easy the identification of the several beds. In the eastern part of the coal fields this limestone is lacking and many more coal beds are present. Furthermore, in parts of Clearfield County in place of a massive sandstone at the Homewood horizon is found clay and shale and an irregular succession of five or six coal beds. There is still one unsettled problem affecting the

lower Allegheny group. In several counties a valuable flint clay occurs at what David White has assigned as the Mercer horizon in the Pottsville Series. The Maryland geogolists studying at this horizon have concluded that the clay is in the Clarion member in the Allegheny group and above the Brookville coal. Recent studies in Clearfield County seem to confirm this conclusion though without certainty. Also, recent studies by Mr. White have indicated that the flora at the horizon of the Brookville coal is very similar to that at the horizon of the Mercer coal, though immediately below the Lower Mercer coal a distinctly different flora appears.

A general view of the stratigraphy of the group is given in the figure.

COALS OF ALLEGHENY GROUP.

Coal 77c2 (Upper Freeport). The Upper Freeport coal is one of the most persistent and valuable coals of the group. It appears to have been formed over all, or nearly all, of the area within its outside limits. Over large areas, however, it was more or less completely removed by stream erosion following an uplift that took place after its formation but before the deposition of the Lower Mahoning sandstone. In other areas it is so badly split up with partings or is so shaly as to lose much or all of its value. This bed is finely exposed in the east bank of Allegheny River above the railroad track from the type locality at Freeport down stream to Arnold. The bed is clearly exposed for probably half of the seven miles between the two places, reaching a thickness of 7 feet near Arnold. In part of this stretch, as in other places, the upper part or all of the coal bed is cut out by subsequent stream erosion and replaced by Mahoning sandstone. The bed averages between 6 and 8 feet thick in some small areas, from 3 to 6 feet thick in much larger areas and under 3 feet thick in possibly more than half the area underlain by it.

In a small area in northeastern Allegheny County, southern Butler County, and extending over into Westmoreland County, the Upper Freeport coal is from 2 to 10 feet thick, with an average thickness of not far from 7 feet. In this area it is called the "Thick Freeport" or "Double Freeport." It is not the Upper and Lower Freeport beds combined. The increased thickness is an addition to the top of the coal bed. Where thickest there is commonly 2 feet of cannel coal at the top.

The Upper Freeport is the most persistent of the Allegheny coals in the southwestern part of the State, varying from a few inches to 6 feet, and up to 7 feet in the Ligonier Valley, where the bed is persistently from 4 to 6 feet thick over considerable areas.

Coal 77c1 (Lower Freeport). Present information suggests that instead of coal at a single horizon, there may be several closely over-

lying or overlapping coal horizons in the space from 30 to 65 feet below the Upper Freeport coal. The Lower Freeport coal has always been recognized as a variable coal, locally reaching a thickness of 15 or 16 feet, though thinning away to a feather edge in a short distance. In other regions, as in the Moshannon basin in Clearfield County, this bed is known to split, the two parts becoming as much as 55 feet apart. In Cambria County it is known to be represented by two beds at slightly overlapping horizons. In Jefferson County the laying down of its roof shales was followed by uplift that allowed the removal of large areas of the coal. So that while this horizon has large areas of thick coal, the coal appears to be less regular than that at the Upper Freeport horizon. The Upper and Lower Freeport beds are separated by about 40 feet on the average, though the interval may locally be as much as 65 feet or elsewhere be down to 20 feet or even less.

The Lower Freeport coal has long been mined in large volume in Clearfield and Jefferson counties. It is from 4 to 8 feet thick over large areas. Large areas still remain unmined in Indiana, Cambria, Armstrong, Clearfield, and Jefferson counties.

Coal 77b3 (Upper Kittanning). This bed, which commonly is found about 100 feet below the Upper Freeport coal, is of very minor importance in most of the bituminous field of Pennsylvania. It is a good 6-foot bed south of Johnstown and is the thickest bed in the Allegheny group along Chestnut Ridge in Fayette County. Locally its thickness is increased to 12 to 20 feet by the presence of one or more benches of cannel coal. Most of the cannel coal of the State appears to be at this horizon. Some of the cannel at this horizon has lost the high volatile content characteristic of cannel coal and is chemically similar to the bituminous coal with which it is associated.

Coal 77b2 (Middle Kittanning). Several coals occur between the Upper and Lower Kittanning coals. Whether these are at a few definite horizons cannot as yet be stated. In Clearfield County there appear to be in this interval not less than three horizons, and probably five, at which coal occurs, and it has been suggested that the variable vertical position of coals in this space may be due to the occurrence of non-persistent coals at several distinct horizons. As a rule, in Pennsylvania, coals in this part of the group are of little commercial value, but in places the coal is thick enough to have attracted commercial exploitation. In Ohio this coal is correlated with the famous "Great Vein" of the Hocking Valley region. Most of the workable coal at this horizon is found in Butler, Westmoreland, Jefferson, and Clearfield counties.

Coal 77b (Lower Kittanning). The Lower Kittanning coal appears to be the most persistent coal bed of the Allegheny group.

Locally, as in the Berwin district of Somerset County, it is a bed of both fine quality and good thickness. As a whole it is not a thick coal, but over wide areas it is regularly $2\frac{1}{2}$ to 4 feet thick. In some areas it is a double or triple bed and in these areas all of the benches may be equally persistent or one of the benches may be persistent while the others may vary widely in thickness, and may add greatly to the value of the main bench at one point and be worthless at some neighboring point. Considered broadly this bed is generally more than 1 foot 8 inches thick and less than 5 feet thick.

It is, next to the Upper Freeport, the most important coal in the group. It is the most important bed in Armstrong, Beaver, Blair, Bradford, Cambria, Centre, Clarion, Clearfield, Clinton, Lycoming, and Somerset counties.

Coal 77a3 (Scrubgrass). Immediately below the Vanport limestone is a thin coal bed called the Scrubgrass coal. Its maximum thickness is 18 inches on the Connoquenessing. In the northern part of Butler County it averages about 9 inches. It lies 20 to 30 feet above the Clarion coal.

Coal 77a2 (Clarion). Work in Clarion and Armstrong counties has shown that in those counties there are locally not less than three beds of coal between the Lower Kittanning coal and the Brookville coal. The lower two of these have been thought to be splits of the same bed and called the Upper and Lower Clarion coals, the interval between them ranging from 2 to 25 feet at different points. In other areas all three of these coals may be lacking. In other areas only one coal is found below the Lower Kittanning in the Allegheny group but at such a distance below the Lower Kittanning as to leave an uncertainty as to whether it should be considered the Clarion or the Brookville. An attempt was made in the summer of 1916 to obtain collections of the fossil plants associated with the Brookville and Mercer horizons so as to aid in their future differentiation, but with not all the success desired. The Clarion coals are commonly thin and of little commercial value, but like the other minor coals of the group they thicken locally so as to be of value. This is especially true in Clarion County.

Coal 77a (Brookville). This coal is not important in Pennsylvania though locally it is 6 feet or more thick and mined on a large scale. Its tendency to carry a high percentage of ash has given it locally the name "Dirty A." It is an important coal around Brookville, in parts of Clearfield County, in the southern part of the State, and in West Virginia.

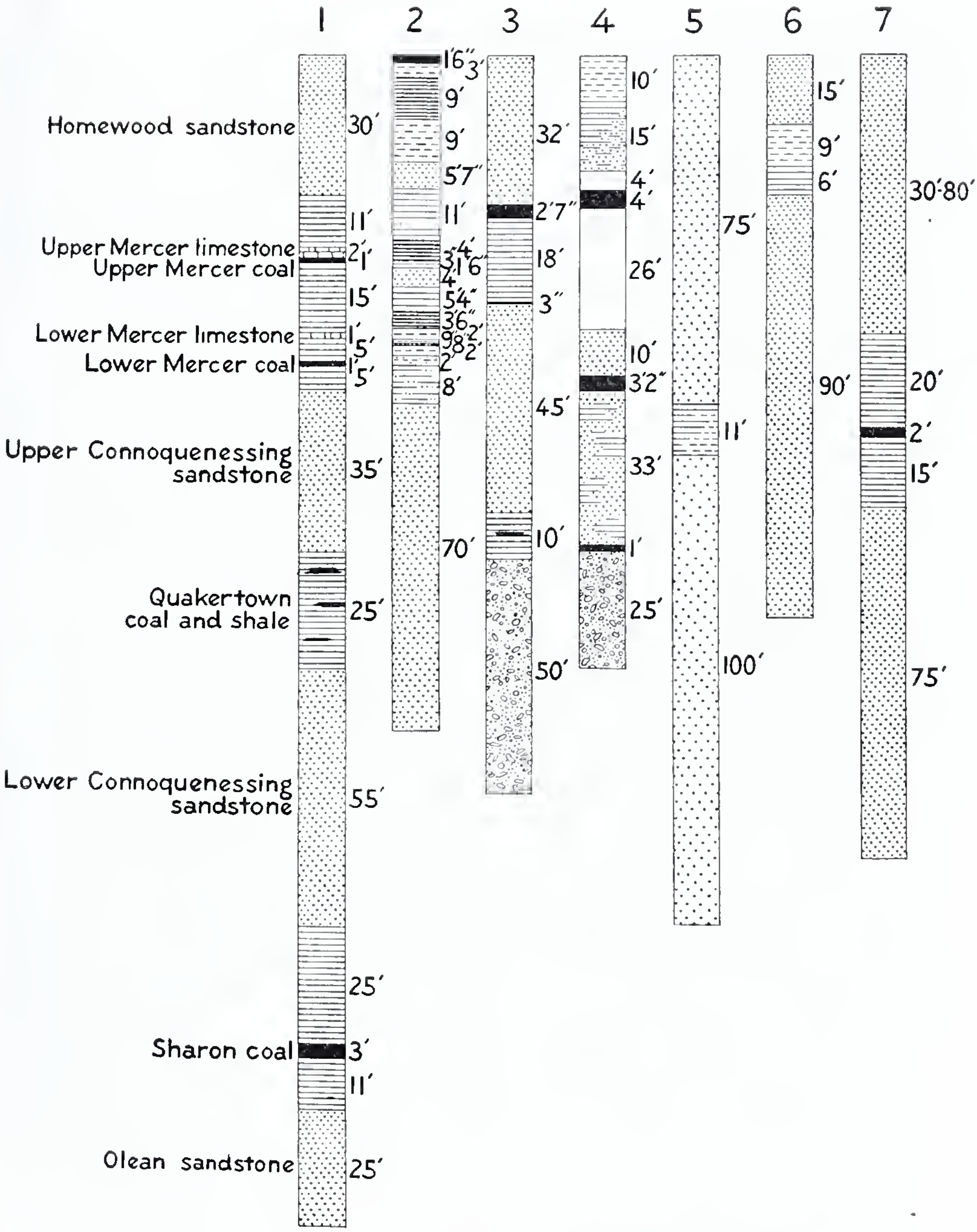

Fig. 21. Selected sections of Pottsville series.
1. Beaver River. 2. Clearfield (?) County. 3. Elk County. 4. Clinton County. 5. Johnstown. 6. Gallitzin. 7. Westmoreland County.

Upper Pottsville (Kanawha) Series

General character and thickness. The name Pottsville conglomerate was given in 1877 by Charles A. Ashburner of the Second Geological Survey to the massive sandstones and conglomerates at the base of the Coal Measures, in general equivalent to the Millstone Grit of very early reports. In the Pottsville region the "conglomerate" is mainly sandstone and conglomerate about 1100 feet thick containing a number of coal beds that are generally thin and unworkable, but that in parts of the anthracite region have thicknesses

of 10 feet or more. In western Pennsylvania the Pottsville is thin, commonly less than 200 feet. Later studies, especially those by David White, have shown that the thinness in western Pennsylvania is in part due to the fact that western Pennsylvania was above sea level and undergoing erosion while the Lower Pottsville deposits of eastern Pennsylvania were being laid down. Because of this period of erosion the Mauch Chunk red shales are lacking over much of the northwest corner of the State and even the upper Pocono is lacking in part of the same area.

Furthermore, most elaborate studies by David White have shown that southward from Pennsylvania the Pottsville increases in thickness until in southern West Virginia it is nearly 4,000 feet thick, and contains sixty-five named coal beds, including nearly all of the beds mined in that area. Still farther south, in Alabama, the Pottsville is 7000 feet thick. Indeed, Mr. White has shown that practically all of the coal mined in the Appalachion region south of the 37th parallel is of Pottsville age.

Naturally the Pottsville south of Pennsylvania has been divided into groups and members. In order that the subdivisions used in Pennsylvania may correspond with these the writer has followed the division of the Pottsville into an upper and lower series; the upper corresponds with the Kanawha of West Virginia, which is there 1830 feet thick, and the lower with the New River and Pocahontas of Virginia and West Virginia, which are together about 2000 feet thick in that area. The Kanawha series is then divided into Upper, Middle, and Lower Kanawha groups, each about 600 feet thick. These in turn have been divided into members, each about 100 feet thick. The Lower Pottsville series is divided into an Upper and Lower New River, and Pocahontas groups, also each about 600 feet thick. The Upper Kanawha extends from the Stockton coal to the Chilton coal; the Middle Kanawha from the Chilton to the Campbells Creek coal (Freeburn, Warfield, or Upper War Eagle); the Lower Kanawha from the Campbells Creek bed to the Gilbert bed. The Upper New River extends from the Gilbert bed to the Sewell (Davy) coal.

The Lower Pottsville series is not represented in Western Pennsylvania. The Homewood and Mercer members are thought to represent about the time equivalence of the Upper Kanawha; the Connoquenessing sandstone and Sharon coal to be the Middle Kanawha (the Sharon coal being correlated with the Campbells Creek coal); the Sharon or Olean sandstone conglomerate is thought to be of Lower Kanawha age.

As a whole the Pottsville in the bituminous field of Pennsylvania is predominatingly sandy, composed of sandstones, conglomerates, shales, and irregular coal beds, with local development of limestone, iron ores, and valuable, highly refractory, flint clays. It is from

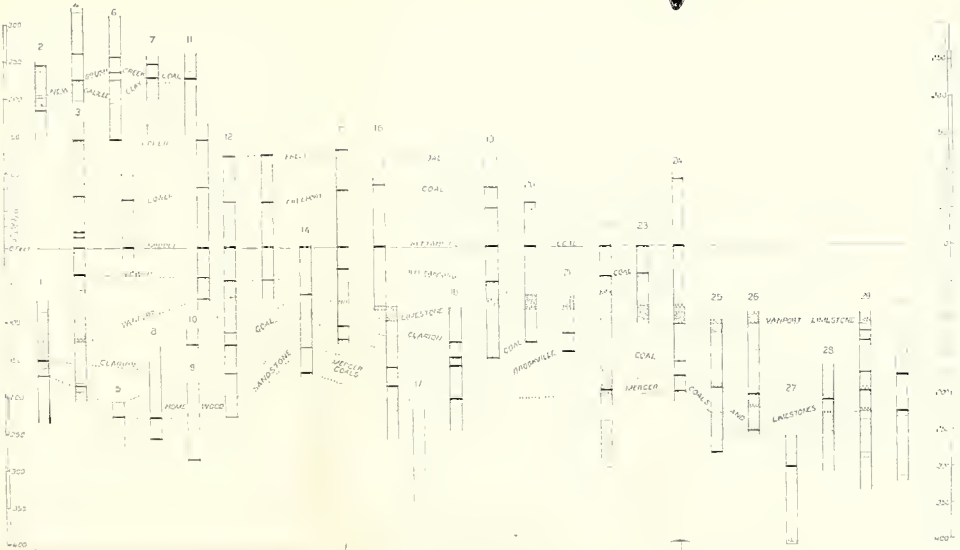

PLATE VII

1. Beaver Falls, south end
2. Beaver Falls, hilltop ½ mile east of
3. River bluff opposite Beaver Falls
4. Road 1 mile E. of Eastvale
5. Hill ½ mile south of mouth of Bennett Run
6. Opposite P. & L. E. R. R. depot, Beaver Falls
7. Road at head of Bennett Run
8. Northeast of Morado 1 mile
9. Thompson Run
10. Mouth of Thompson Run
11. Road 2 miles E. of Thompson Run mines
12. Bellton
13. Southwest of North Sewickley above mines of Hazen Miller
14. East of Bellton 1 mile
15. East of North Sewickley
16. Ellwood City tunnel
17. Ellwood City, east end
18. Wurtemberg, north of
19. Road east of Squaw Run
20. Ellwood City, north of
21. Mouth of Lone Hell
22. Chewton, 1 mile south of
23. 1½ miles N. of Chewton
24. Schreckert farm, 1 mile N. of Union Valley
25. Ravine between Rigby and New Castle Junction
26. Ravine between Rigby and New Castle Junction
27. East of Rigby
28. Carcmies near Joyce,
29. Northeast of Mahoningtown behind Lawrence School
30. Road 1 mile E. of Covert

100 feet to 350 feet thick. It outcrops over a broad belt around the northern edge of the field where its sandstones have helped to maintain the high plateau character of a broad stretch of country. In some areas it is mainly sandstone, in others mainly shale. On the whole it is more sandy than any of the overlying formations, and commonly produces a rougher type of topography. Where most fully developed in western Pennsylvania it contains at least four sandstones, the Homewood, Upper and Lower Connoquenessing, and Sharon. The Sharon sandstone or conglomerate is commonly lacking in the eastern-central part of the field, and locally even one or both of the Connoquenessing sandstones may be missing, apparently never having been laid down. These lower sandstones are absent because the area where they are lacking was above water level and subject to erosion rather than deposition during the time they were being laid down elsewhere.

COALS OF THE POTTSVILLE SERIES.

Coal 76a (Mercer). There are two or three coals at this general horizon along Beaver River, as shown in the sections on figure 21. The coals are commonly thin and of little or no interest, though locally they have a thickness that gives them local value. In many areas there is only one coal at this general horizon or none at all. But on the other hand there may be locally, as in Clearfield County, four or five coals below the Brookville within the space usually assigned to the Mercer coals.

Coal 75b (Quakertown). Between the two sandstones of the Connoquenessing is commonly an interval filled with shale, locally 50 to 60 feet thick. This in places contains one or more coal beds generally only a few inches thick and valueless.

Coal 75a (Sharon). The Sharon coal has been one of the coal assets of Ohio and Pennsylvania but is now nearly worked out. The coal has been of value in Pennsylvania only in the northwest corner of the field, but has been worked along much of the western edge of the coal field in Ohio. This coal in Mercer County and westward in Ohio is a block, non-coking coal that in early days was used in blast furnaces without coking.

GEOLOGICAL STRUCTURE.

General statement. In recent geologic work the determination and delineation of the structure or lay of the rocks has been considered of the highest importance and a large share of the work has been devoted to its study.

If it were possible to remove all of the rocks lying above the top of any selected rock layer in western Pennsylvania, as the Pittsburgh

coal, or better still the Upper Freeport coal, it would be found that the top of the layer forms a surface like that of a gently rolling country, consisting in the main of low rounded ridges or swells between equally gently rounded valleys. These valleys, or a corresponding ridge, might range in width from a mile or less to a maximum of 8 or 10 miles, and difference of elevation between valley and ridge from 50 feet to 1000 feet or more. The slope from ridge to valley would commonly be found to be less than 400 feet to the mile and more commonly less than 200 feet to the mile. A few of the ridges would show slopes exceeding those figures, especially in the eastern part of the field, while in the western part of the field the slopes are commonly less than 100 feet to the mile. It would be noticed that the ridges and valleys have a general trend from northeast to southwest, though neither the crests of the ridges nor the bottoms of the valleys follow straight lines or run exactly parallel. The crests or valley bottoms would not be found to be even but to rise or sink along their axes, forming either one or a succession of domes and basins separated by low points or gaps in the ridges and high divides in the basins. Some of the ridges could be traced for several score of miles, high and strong at one place and low and less distinct beyond. Other ridges, and the same is true of the valleys, are short and pinch out between adjoining valleys. In places the highest part of a ridge would be found adjoining the lowest part of the valley either side of it. Elsewhere it would be found that the highest part of a ridge is beside a saddle between two basins in the adjoining valley.

Considering the general parallelism of the structural ridges and valleys it would be expected that shortening of the strata by the folding would be equal along any line at right angles to the folds. Calculation by the writer has shown that the actual shortening by one of these low folds is very small. Thus the Upper Freeport coal where arched over the Chestnut Ridge anticline between Punxsutawney and McGees Mills, rises 750 feet above the cord of the arch. It would normally be thought that a train following a tunnel through the anticline would have a much shorter trip than one following the coal over the arch, yet the difference is less than 5 feet. As this is one of the strongest folds in the field it would appear that the total shortening across the whole field must be very small, probably not over 50 feet all told, and in some sections probably not half of that.

Finally it would be noted that the ridges and valleys become lower and lower toward the west, forming wrinkles on a broad major valley or geosyncline whose axis runs southwest from Pittsburgh to Huntington, West Virginia. The result is that the Upper Freeport bed, which is 2,000 feet above sea level on the eastern side of the field, is 500 feet below sea level along the axis southwest of Pittsburgh.

Continuing the figure already used, it is obvious that if the top of the Upper Freeport coal had been exposed by the removal of the overlying rocks it would be possible to represent the surface so exposed by contour lines in the same way that the ordinary land surface is represented on topographic maps. On the map, plate II, the structure or folding of the rocks is represented by 100-foot contour lines. Where these are solid they are taken from the results of recent geological work. Where dotted they are inferred by connecting together the areas on either side already determined. The position and slope of these folds, the names that have been applied to them, their extent, and other relations are brought out graphically on the map and need not be described further here.

The structure contours on the large map are drawn on the Pittsburg coal west of the crest of Chestnut Ridge and south of the Conemaugh-Kiskiminetas-Allegheny-Ohio rivers and on the Upper Freeport coal east and north of that line. In preparing the map, the structure maps already published or prepared on the one inch to the mile scale were reduced photographically to the scale of the new map and the structure transferred. In several of the quadrangles the structure as originally drawn was on the base of the Pittsburgh bed or top of the Upper Freeport bed. In those instances the structure was transferred without change. In some quadrangles within the area where the Pittsburgh bed is used here as a key rock, horizons such as the Washington limestone and Ames limestone were used on the original maps. Some of the maps in the area east of Chestnut Ridge and north of Conemaugh River were originally contoured on the Lower Freeport, Upper, Middle or Lower Kittanning coal, Vanport limestone, or other bed. In these areas where some bed other than the Pittsburgh or Upper Freeport was used on the original map it has been necessary to shift the contours from the level of the stratum originally used to the stratum here used. If the stratum originally used was below the Pittsburgh or Upper Freeport, the stratigraphic distance between the two was added to the contours as originally drawn. If the original key stratum was above the horizon here used, the stratigraphic interval to the stratum here used was subtracted. For example, in an area originally contoured on the Lower Freeport coal, 50 feet was added to the contours originally drawn to arrive at the contours as here shown. If the stratum on which the structure was originally shown was the Lower Kittanning, 200 feet was added to the original contours.

The following table shows the interval added or subtracted in each quadrangle to or from the contours as drawn in the field in arriving at the structure shown on the map accompanying this report. To compute the actual elevation of any stratum in any quadrangle add or subtract the interval from the stratum to the Pittsburgh or

Upper Freeport coal, as given in the table of coals or in local descriptions, to or from the elevations in that quadrangle shown on the map.

Structure contours were originally drawn on the Pittsburgh coal in the following quadrangles: Amity, Brownsville, Burgettstown, Carnegie, Claysville, Connellsville, Greensburg, Latrobe, Masontown, Pittsburgh, Rogersville, Uniontown, and Waynesburg.

They were originally drawn on the Upper Freeport coal in these quadrangles: Beaver (part), Ebensburg, Elders Ridge, Indiana, New Kensington, Punxsutawney.

Table giving the original key bed for certain quadrangles and the assumed distance from the Pittsburgh or Upper Freeport coals to that stratum.

Areas Contoured on Pittsburgh Coal.

Quadrangle	Original key bed	Interval
Beaver	Ames limestone	+260
Claysville	Upper Washington limestone,	—570

Areas Contoured on Upper Freeport Coal.

Barnesboro, Curwensville, Houtzdale, Patton	Lower Freeport coal	+ 50
Butler	Vanport limestone	+235
Clarion, Johnstown, Windber	Lower Kittanning coal	+200
Kittanning-Rural Valley	Vanport limestone	+250
Meyersdale	Upper Kittanning coal	+100
New Castle, Zelienople	Middle Kittanning coal	+150
Sewickley	Ames limestone	—300
Somerset	Johnstown limestone	+100

In the above table the minus sign indicates that the amount given was subtracted from the elevations given on the original contour map; the plus sign indicates that the amount was added.

Without discussing the structural details, certain general features are readily apparent and need only be mentioned.

First, there is the general northeast-southeast trend of the folds. While not nearly so straight as they have frequently been represented, nevertheless, taking large distances, the folds in this part of the State tend to have axes running about N. 30° E. On the south line of the State the trend is more nearly north, running from N. 20° E. to N. 25° E. Toward the northern part of the map there is marked bending to the eastward, until in the northeast corner of the area mapped the axes have directions of from N. 35° E. to N. 60° E.

In the second place there is noted a marked change from the closely folded anticlines and synclines of the southeast to the open gentle folds northwest of Pittsburgh where the structure is little more than an irregular, very gentle slope in which some parts project very slightly beyond adjacent parts. So gentle is much of the structure at the northwest that, except for the spirit-leveled elevations, it would hardly have been possible to detect any variations from a uniform slope, and experience has shown that in many cases even these slight irregularities in the slope seem to have had a marked effect on the position of oil and gas pools.

In the third place it will be noted that the folds are, as it were, but wrinkles on the surface of a broad syncline, of which the axis runs southwest and northeast through Pittsburgh. South of Pittsburgh this axis coincides with the axis of the Nineveh syncline and farther north with the axis of the Fairmount syncline. Thus at the southeast on the Dulany anticline, the position of the Pittsburgh coal is theoretically 4,200 feet above sea level; on the Fayette anticline 1,800 feet above sea level; on the Belle Vernon anticline 1,050 feet above sea level; on the Amity anticline, the same, and in the Nineveh syncline it gets down to less than 100 feet above sea level. This is possibly even better brought out by a line through Indiana. Thus starting 10,000 feet above sea level in the southeast corner of the Ebensburg quadrangle, the Pittsburgh coal even in the Pavia syncline does not get below 4,200 feet above sea level; in the deep Wilmore basin to the northwest it gets down to 1,700 feet; farther west it keeps above this elevation until the Laurel Hill axis is crossed where it has a maximum elevation of 3,900 feet above tide, though only 2,800 feet in the line being followed. From the Laurel Hill anticline to Indiana the synclines carry the coal below 2,000 feet, and the anticlines raise it above 2,500 feet. The Latrobe syncline carries the coal down to 1,700 feet at Indiana and still lower farther south. The Elders Ridge syncline carries it down to 1,500 feet and down to 1,110 feet farther south. The Greenville anticline can only raise it to 2,300 feet farther north, but only to 1,600 feet in the line here followed, while in the Fairmount syncline the Pittsburgh coal south of Kittanning is, or would be if present, only 1,550 feet above tide.

In the fourth place it is to be noted that in the center of the major synclinal axis there is a general rise of the structure in the direction of the axes of folding to the northeast. Thus in the axis of the major syncline in the southwest corner of the State the Pittsburgh coal is down almost to sea level—locally within 100 feet of it. Going toward Pittsburgh the strata in the center of the basin rise as in climbing toward the point of a spoon until at Pittsburgh the coal of that name is 1,000 feet above sea level. Going northeastwards

the same rise continues until in the Clarion quadrangle in the lower part of the major basin, the Pittsburgh coal is theoretically over 2,000 feet above sea level. If the Uniontown syncline be followed it will be found near Uniontown to bring the Pittsburgh coal down to 550 feet above tide. At Latrobe the coal is not below 700 feet; at Blairsville about 1,000 feet; at Indiana it is 1,700 feet above tide. This tendency to rise to the northeast does not continue southeast of the Chestnut Ridge, and in many parts of that area may be reversed. Thus in the Uniontown quadrangle the calculated position of the Pittsburgh coal above Chestnut Ridge is about 4,000 feet; east of Latrobe less than 3,500 feet; east of Indiana only 2,500 feet. East of Punxsutawney it rises again to between 2,700 and 3,000 feet above sea level.

In the Elliotsville syncline east of Chestnut Ridge the Pittsburgh coal is theoretically above 2,100 feet. East of Indiana it is down to 1,900 feet, but in the Curwensville quadrangle it ranges between 2,000 and 2,350 feet.

Fifth, it emphasizes as has never been done before the undulating character of the folds in the direction of the axes.

No such even-crested anticlines or even-bottomed troughs or synclines as have usually been pictured have been found to exist in the area covered by the map. Instead, the synclines appear to be a series of elongated oval or spoon-shaped basins separated by relatively high divides or buckles; and the anticlines consist of elongated or oval domes or crests separated by low sags. A study of the relative position of these basins and crests brings out some interesting points. In the Uniontown-Connellsville quadrangles the basins and crests are set in alternate arrangement, while in Cambria County they are opposite. Thus, for example, the Uniontown basin is not opposite the highest part of the crests of the adjoining anticlines, but opposite the sags of those anticlines, and vice versa. In Cambria County, on the other hand, it will be noted that the highest part of the Ebensburg anticline is almost exactly between the lowest parts of the Wilmore and Johnstown basins adjoining it on either side. This is even more strikingly shown in the Latrobe quadrangle where domes in the Fayette and Chestnut Ridge anticlines and basins in the Greensburg and Latrobe synclines all fall in a line nearly normal to the strike. The same thing is true in the Elders Ridge quadrangle, of the domes and basins in the Roaring Run anticlines, Elders Ridge syncline and Jacksonville anticline. On the whole the opposite arrangement appears to be more common than the alternate, though not enough so as to be made the basis of a theory in the matter. In the case of the Latrobe quadrangle a line nearly normal to the structure through the points of maximum folding south and west of Latrobe, from the southeast corner of the quadrangle to the Greens-

burg syncline, would cross contour lines to the extent of 5,400 feet; one through the maximum folding south of Blairsville would cross 5,150 feet, while through the nodes between, a line would cross only 4,150 feet. Other cases are even more striking. A nearly east and west line a little north of Johnstown in crossing from the Wilmore syncline to the Laurel Hill anticline, would climb up 2,950 feet and down 750 feet or a total of 3,700. A parallel line through Ebensburg would climb up 900 feet and down not at all.

Unfortunately the areas not yet mapped prevent extending this study broadly. It should be noted, however, that in the cases cited the lines passing over the greater amounts of ascent and descent in the structure are not proportionately longer than the other lines. The difference is made up in the difference in the steepness of the structural slope. Now it is a well known fact that a highly convex arch is longer than a lower arch of the same span. It would therefore appear that along certain lines transverse to the folding any selected rock stratum, as folded, is longer across the areas of maximum folding than the same rock is along other selected lines or what might be called nodal lines as they pass through the nodes of these undulating axes. This difference is probably not large.

Another question is raised by observing these nodal lines and lines of maximum folding. Have there been axes of cross-folding action? This too will be passed by at this time. It is probable that the structural geology must be mapped in a considerable area before some of these questions can be examined with any satisfaction.

Fault structure. In the area of the Houtzdale quadrangle are faults of sufficient size to noticeably influence the structure contours. The faults shown in Figure 6 are only a small part of those recognized. It must be admitted that in many cases the structure shown in connection with these faults is highly conjectural. Information about the faults has been obtained by observation, by report of mine superintendents and others, and from mine maps. In some cases the faults are shown on mine maps and the direction and downthrow can be accurately determined. In other cases the fault has been mined up to for short distances, sufficient to give its direction but not its extent, and often not its throw. As far as seen by the writer, all appear to be of the normal type. The down-throw varies from 0 to 200 feet or more; the fault-plane is usually nearly vertical. Examination of the fault faces shows that the faulting movements were in a large measure horizontal, the horizontal element probably exceeding the vertical. The west side of the fault was dropped more frequently than the east side, though not enough so to make a rule. The writer has been led to compare these faults with other faults similarly placed with reference to the Allegheny Front as found in Virginia, Kentucky, Tennessee, and Alabama.

In all cases the faults appear close to the Allegheny Front, as though produced by the pressure that uplifted the rocks in that ridge. In the second place instead of being parallel to the strike, the faults cut it at an angle of about 45°. All of these facts have led the writer to conclude that these faults are the result of pressure which folded and ruptured the rocks, such rupturing having taken place in the lines of maximum stress, which in this case are at nearly 45° to the direction in which the pressure acted. Rupturing of this kind is seen in the spalling off of the angles of a block of building stone under great pressure. That these faults probably extend up into the Allegheny Mountains in the southeast corner of the Houtzdale quadrangle is a fair inference, but lacking knowledge to that effect, they are not so represented.

DISTRIBUTION OF COAL

This part of the report is a brief discussion of the distribution of the coal by counties. The geographic and geologic occurrence of coals in each county is discussed, also their general distribution as affected by the structure; the relative importance of each bed; how the beds vary in thickness and physical character from place to place with special reference to areas where one or more of the beds are workable. Part II of this volume gives the same data in detail.*

Allegheny County

Coals. The Washington coal is the youngest coal of possible workable value in the county. It is in the Dunkard group. The Lower Kittanning is the oldest and deepest of the coals of possible value. It lies near the base of the Allegheny group. The Pittsburgh and Upper Freeport have the greatest value. The Lower Kittanning underlies the greatest acreage.

The Washington coal occurs only in a few hilltops in South Fayette Township. The Waynesburg coal at the top of the Monongahela group, underlies the hilltops in a considerable area south of Pittsburgh and west of Monongahela River. The Pittsburgh coal at the base of the Monongahela group underlies most of the area in the southern part of the county, west of Monongahela River and south of a line from Pittsburgh to the extreme west corner of the county. Within that area the Pittsburgh bed is above drainage except in the center of the syncline. It rises from 750 feet above sea level at the south line of the county to 1050 at "The Point" in Pittsburgh, and to 1300 feet 4 miles to the north of that place. The Pittsburgh bed underlies the tops of the hills between the Allegheny on the north and the Monongahela and Youghiogheny on the south. North of Allegheny and Ohio rivers the Pittsburgh occurs only in the tops of a few hills, and has been entirely eroded from the northern part of the county.

The Allegheny coals underlie the whole county except for a small area along Allegheny River and along Pine Creek. In these areas the Upper Freeport coal is eroded. In general the Upper Freeport coal in this area occurs approximately 600 feet below the Pittsburgh. The Lower Kittanning coal occurs about 800 feet below it.

Structure. The general structure in the county is a broad spooning syncline, with a main axis, Nineveh syncline, extending southwest from the junction of Allegheny and Monongahela rivers. The general dip toward this axis is from the west, north and east and

*A fire in the State Printery, May 8, 1927, destroyed all the remaining stock of Part II of this volume.

is modified by a number of minor synclines and anticlines which run east of north and west of south. All of the coals from the Washington to the Lower Kittanning occur in the center of this syncline.

Distribution of coals. The Pittsburgh bed is the most important and valuable in the county, but it is approaching exhaustion and the Upper Freeport is growing in prominence. Its occurrence above drainage, its excellent physical and chemical character in Allegheny County led to its early development. The type section of the Pittsburgh bed occurs in Allegheny County. The following bed section is typical: The roof coal is a few inches to 4 feet thick, in places it is all coal, but it is generally broken into benches of variable thickness by clay partings which locally compose more than half the bed. The main clay occurs below the roof coal and is 6 inches to 2 feet thick. The lower division or main coal occurs beneath the main clay. It consists of the breast coal 2 feet 6 inches to 7 feet thick, a bearing in bench averaging about 3 inches thick, the brick bench, a foot or less thick, a bottom bench ranging from 1 to 1½ feet thick. The lower division ranges from 5 to 7 feet in thickness in Allegheny County. These benches persist over the entire area of this coal in southwestern Pennsylvania. The Pittsburgh coal in this county contains a number of swamps and rolls due to irregularities in the floor and roof. In some of the swamps the thickness has been greatly increased, and it is decreased under the rolls. Clay veins are very numerous.

None of the coals above the Pittsburgh are of present commercial value in this county. The Redstone coal, 60 to 70 feet above the Pittsburgh, ranges from a few inches to 5 feet thick. The best coal is in the south end of the county where it is locally 3 to 5 feet thick and fairly clean. The Sewickley and the coals above it are too thin or dirty in this county to have commercial value at present.

The coals in the Conemaugh group, though fairly persistent, are generally too thin to be of value in this county. Several of them have a local maximum thickness of 2 feet 6 inches. In the northwest corner of the county the Duquesne coal is locally 5 to 6 feet thick.

Little is known about the Allegheny coals except of the Upper Freeport. This coal ranges from 2 to 10 feet in thickness in the northeast corner of the county. Where it is thickest 2 feet of cannel coal occurs at the top and a foot or less of bony and additional shale partings separates the main bed into two or more benches. This coal is mineable near McKeesport, but it varies much in thickness. Little is known about the Allegheny coals in other areas because they are deep under cover, but drilling has indicated that they have only local value and are entirely absent in large areas.

Armstrong County

Coals. This county contains all of the coals from the Sewickley to the Brookville.

Structure. The structure includes a broad prominent anticline, the Kellersburg, crossing the northwest part of the county, which brings to the surface large areas of Allegheny rocks; and a major syncline, the Elders Ridge, at the southeast corner, which carries the rocks so low that a small area of Monongahela rocks and coals remain in the hilltops. Between these two structures are a number of minor anticlines and synclines having a general northeast-southwest trend.

Distribution of coals. The Pittsburgh coal occupies a very limited area in the southeast corner of the county, and is a part of the Elders Ridge field. The main or lower division of the bed has a thickness of 5 to 10 feet, it is generally separated into three or more benches by partings ¼ inch to 1 foot thick. It averages approximately 7 feet thick. Although this coal has many partings, it has served much local trade, and is being shipped. The Sewickley and Redstone coals have a local thickness of 3 feet, but average much less. They underlie very small areas in the hills above the Pittsburgh coal.

The Conemaugh group underlies most of the uplands of this county. In general the coals are thin and worthless. The Bakerstown has a reported thickness of 4 feet on Crooked Creek. The Mahoning coal is 3½ feet thick in the same area. The Brush Creek bed has a maximum thickness of 2½ feet on Crooked Creek.

The Upper Freeport coal, lying at the top of the Allegheny group, and known in the southern part of the county as the "4 foot coal," is a valuable coal in this county. It is 7 feet thick on Long Run, and is 3½ to 4½ feet thick in many parts of the county. It probably averages over 3 feet thick.

The Lower Freeport coal has a local maximum thickness of 2 feet at numerous places and is generally much thinner. Near Jacksonville it has an abnormal thickness of 5 feet in a small area. It is probably of value in other parts of the county.

The Upper Kittanning coal is generally worthless in this county but south and southeast of New Bethlehem at Bostonia and near Sommerville it consists in part of cannel coal where its thickness is locally 10 to 15 feet. In a few other places the Upper Kittanning coal is over 2 feet thick.

The Middle Kittanning coal has little value in the county. It is nearly 5 feet thick south of Wattersonville, 3 feet thick near Mahoning Furnace, and 2 to 5 feet thick above Echo. In general it is less than 18 inches thick.

The Lower Kittanning coal is the most important coal in the north-

west part of the county, especially west of a line from Kellersburg through Kittanning. Within that area it is nearly everywhere over $2\frac{1}{2}$ feet thick, averaging nearly $3\frac{1}{2}$ feet and is locally 4 feet thick. In places it is badly parted with shale and is very sulphury locally. Near New Bethlehem and along Mahoning Creek east of Putneyville this bed is 2 to 4 feet thick. It is below drainage under most of the southern part of the county.

The Clarion and Brookville coals are below drainage or not known to be of value in the southern or eastern part of the county. Near Craigsville a coal is over 3 feet thick. The Clarion is 2 feet thick near the same town, and 3 feet 8 inches at West Greenfield.

The Lower Mercer coal appears to have little or no value in this county, although it is reported 3 feet 2 inches thick in West Franklin Township, and 2 to 4 feet thick along the upper part of Mahoning Creek.

The Allegheny coals underlie all of the south half of the county except in the bottoms of the major valleys. The general northward rise brings these coals to the hilltops in the northeast part of the county, and the larger streams cut through them. The Kellersburg anticline brings them all above drainage along Buffalo Creek in the western part of the county.

Beaver County

Coals. This county contains workable coals in the Monongahela, Conemaugh, and Allegheny groups. The Pittsburgh is geologically the highest coal. The Upper Freeport, the Middle and Lower Kittanning are the principal beds. Several of the other beds are of value locally.

Structure. The structure of the rocks in this county is that of a monocline with an irregular dip of about 500 feet from the north central part of the county to the southeast corner. As a result of this dip there is a general rise of the rocks to the northwest that restricts the Pittsburgh coal to a few hilltops in the south part of the county and brings the Allegheny coals to the surface along Ohio River, and even exposes the Pottsville rocks and coals along Beaver River.

Distribution of coals. The Pittsburgh coal is confined to a few hilltops in Hanover and Hopewell townships. It is 4 and 5 feet thick, but of poor quality because of thin cover. The Conemaugh coals are of no value in this county, though near Georgetown the Barton (?) coal reaches 3 feet, and east of Georgetown the Bakerstown bed is 7 feet of cannel coal.

The Upper Freeport coal, the most important coal in the county, is 5 feet thick in the north part of the county, but this thickness is irregular due to pre-Mahoning erosion. Southward the coal is thinner, but the quality is better. East of Ohio River it is approxi-

mately 1 foot thick. In the central part of the county north of Ohio River and west of Beaver River it averages only 17 inches and has a maximum thickness of 27 inches; toward the Ohio State line the thickness increases and it is locally 4 feet or more in thickness. Areas of thick coal in this part of the county are very limited in extent. South of Ohio River the coal is variable in thickness, but it is locally 3 to 4 feet thick.

The Lower Freeport is generally thin in this county. In many localities it is little more than bituminous shale with thin coal partings. It probably does not average over 15 inches thick, although it is locally 4 feet thick.

The Upper Kittanning coal had no value except in the northwest corner of the county. It is absent or represented only by black shale. In the Cannelton region in Darlington Township it contains 1 foot of bituminous coal overlain by cannel coal 13 feet thick in the axis of a trough but it thins out on either side.

The Middle Kittanning, or Darlington coal, is 4 to 36 inches thick in the southern and central part of the county, but improves in thickness toward the north edge of the county, where it is 22 to 28 inches thick, and has a local maximum thickness of 4 feet.

The Lower Kittanning is a thin but a fairly persistent bed ranging from 14 inches to 30 inches in thickness. It is of value because of its thick bed of underclay, with which it has been mined above Rochester, east of New Brighton, on Blockhouse Run, near Beaver Falls, and elsewhere. At many points where it is thick enough to mine it is high in sulphur.

The Clarion coal is 6 to 12 inches thick in places near Beaver Falls. In other parts of the county it is generally absent.

The coals below the Lower Kittanning appear to be thin and valueless. The Brookville coal is 39 inches thick at the mouth of Brady Run, but it is shaly.

Bedford County.

Bedford County covers part of the Broad Top Coal Field. This field is an outlier from the main field found in a high dissected tableland known as Broad Top Mountain, lying in the northeast corner of the county.

Coals. All of the Allegheny coals are found in this field. Three of these are being mined, the Fulton, correlated with the Clarion, the Barnett or Lower Kittanning, and the Kelly or Upper Freeport.

Structure. This field is a remnant preserved in the center of a deep syncline, and an extension of the syncline containing the Northern Anthracite field. The field is a basin, and the underlying Pottsville rocks rise as a rim all around it. In addition to a general rise to the rim at the north the center of the basin is crossed by a northeast-southwest anticline with a simple syncline on the east

and a much crumpled syncline on the west. The folding produces differences of elevation in the same bed of 1800 feet.

Distribution of coals. The Fulton (Clarion or Brookville) bed geologically is the lowest bed of value. It ranges from 3 to 5 feet 6 inches in thickness and appears to be persistent under nearly the whole field. It is generally split with one or more partings, either shale or sandstone, having a thickness of from 1 inch to 14 feet, so that the workable part of the bed is generally not over 3 feet including one or two thin partings.

The Barnett or Lower Kittanning coal ranges from 3 to 4 feet in thickness, and is persistent over the whole field where it is not removed by erosion. Like the other beds it too is generally split by one or more partings of shale or sandstone which have a maximum thickness of 5 feet. Most of the mine sections show one bench of clean coal 2 to 3½ feet thick, averaging approximately 2½ feet.

The Twin bed (Middle Kittanning or Bens Creek), lying a few feet to 25 feet above the Barnett bed, is generally less than 2 feet thick. Two thin coals are in the approximate position of the Middle Kittanning, the thicker one is only 16 inches thick. They have generally been correlated as the Upper Kittanning, but they have the position of the Middle Kittanning as it occurs in the main field to the west. The Dudley bed lies 100 to 135 feet above the Barnett bed and 125 feet below the Kelly bed, and is correlated as the Lower Freeport bed. Judging from the intervals to the other beds, it comes nearer the position of the Upper Kittanning coal. It is local in its occurrence, at one point being 3 feet 8 inches, including an 8-inch parting.

The Kelly or Upper Freeport coal ranges from 3 to 4 feet 6 inches in thickness. It has a shale parting in most sections, generally 2 to 4 inches thick. From its higher stratigraphic position it underlies a much smaller area than the Fulton or Barnett beds.

Four coal beds have been found in the Conemaugh, but except very locally none of them are of value. The Speer (Mahoning) bed at one point is reported 3 feet thick but shaly; the Phipps bed (80 feet above the Upper Freeport) is locally 2 feet 4 inches thick; the McCue Basin bed (Bakerstown?) ranges from 1 to 3 feet.

A 4-foot bed is found in five of the high knobs and known as the Rogers coal. This bed has been correlated with the Pittsburgh bed. The interval of 432 feet above the Upper Freeport, however, suggests a coal in the upper part of the Conemaugh, possibly at the horizon of the Barton coal. The area of this bed is too small to be of commercial value. The hilltops are less than 900 feet above the Upper Freeport coal and as the Pittsburgh bed in northern Somerset is 900 feet above the Upper Freeport it is impossible for the Pittsburgh bed to occur in this field.

The total area of the Broad Top field (Fulton bed) according to Gardner* is 45.1 square miles. The Broadtop field contains 252,918,000 tons of recoverable coal; 41,850,000 tons has been mined out.

Coal has been mined in this field since before 1800. The first commercial shipments were made in 1813. The coal is suitable for coking, steaming, and domestic fuel. It is shipped run-of-mine and sized.

This field covers not only the northeast corner of Bedford County but also the extreme northwest corner of Fulton County. Its northern half lies in Huntingdon County. Further reference to this description will be made in the text.

Blair County.

Coals. The coal beds of Blair County lie in the northwestern corner of Juniata Township, along the western edge of Allegheny Township, in the southwestern corner of Logan Township, and in a very small area on the western boundary of Antis Township, on the crest of the Allegheny Front.

The workable coals are in the Pottsville and Allegheny groups.

The Brookville coal, at the base of the Allegheny group, has a maximum thickness of 5 feet 4 inches but is generally shaly; the Lower Kittanning coal, or the Miller bed of Cambria County, is a regular bed from 3½ to 7 feet thick. The Lower Freeport coal has a local thickness of 3 feet but is shaly and of little or no value. The Upper Freeport or Lemon bed is about 5 feet thick in Blair county, including a shale parting and bony coal at the top. The area underlain is small. The Mahoning coal locally reaches a thickness of 2 feet 8 inches, but its quality is poor.

Bradford County.

Coals. The coal beds of Bradford County are in the Barclay basin. This basin is located in the southwestern part of the county and covers approximately 30,000 acres. It contains two beds of coal, the Lower Kittanning and Brookville. The Lower Kittanning occurs in a number of detached areas of small size. It ranges from a single bed 3 feet thick to a double or triple bed 9 to 10 feet thick containing 6 to 7 feet of coal. The lower or Brookville bed, lying 60 to 80 feet below the Lower Kittanning, has a larger area but is generally less than 3 feet thick including shale partings. The coal has a fuel ratio of about 4 and, according to the Second Survey analyses, has from 5 to 20 per cent of ash, averaging over 10 per cent. Part of the coal is canneloid in physical character, but most of the coal is very tender and breaks in long vertical columns.

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*Gardner, J. H., The Broad Top Coal Field, Top. & Geol. Surv. of Pa. Rep. No. 10, p. 75, 1913.

BUTLER COUNTY.

Coals. The coals of Butler County include the Barton in the upper part of the Conemaugh and all underlying coals.

Structure. In general the structure is monoclinal, and the strata rise gently to the north. This general rise is modified by the Kellersburg anticline which crosses the southeast corner of the county from northeast to southwest, also the Bradys Bend syncline a little to the west of the former and the Harrisville anticline which crosses the northwest corner of the county.

Distribution of coals. In the south half of the county the Allegheny coals are below drainage except in a few of the valleys where the upper coals of this group are exposed. From the data available it appears that the coals as a rule are thicker in the eastern part of the county than in the west.

The Upper Freeport is 18 inches to 3 feet thick on Cornplanter Run; 2 feet to 2 feet 10 inches on Rough Run; approximately 3 feet in the eastern part of Clearfield Township, and nearly 4 feet around Fennelton. The coal decreases to 1 and 2 feet in thickness in the western part of the county where it outcrops on Connoquenssing Creek.

The Lower Freeport has little value in the south half of the county though it is 2 feet 8 inches thick west of West Winfield and is 2½ to 3 feet thick at the mouth of Breakneck Creek in western Butler County.

The Upper and Middle Kittanning coals are of value in the western part of the county. One of these coals has a thickness of 2 to 4 feet in much of the area. These coals are 2 feet or more thick on Buffalo Creek, Rough Run, and along Connoquenessing Creek. The Middle Kittanning coal is locally 8 feet thick on the West Branch of Big Buffalo Creek. The Lower Kittanning coal is 2 to 3½ feet thick along the eastern edge of the county. It is below drainage on Connoquenessing Creek in this county but is thin where it is exposed farther west.

In the northern half of Butler County the coals are more extensively exposed. Along the eastern edge of the county the Upper Freeport is 3 to 4 feet thick, and the Lower Freeport 1 to 5 feet thick. Locally, as in Washington Township, this coal is 9 feet thick, averaging 6½ feet in a small area. The Freeport coals are thin or have been eroded in the western part of the county. The Middle and Upper Kittanning coals appear to be of fair thickness under most of this part of the county.

In the eastern part of the county the Upper Kittanning coal ranges from 6 inches to 5½ feet. In Slippery Rock Township this bed is 3 feet to 3 feet 9 inches thick. It is thinner in the other wes-

tern townships. The Middle Kittanning coal is 8 inches to 2½ feet thick in the eastern part of the county but is 3 feet or more thick in most of the northern townships. The Lower Kittanning coal is 1½ to 3 feet thick, but in most of the sections the coal is 2 to 3 feet thick. Locally the coal is less than 2 feet thick.

The Clarion coal splits in the northeast corner of the county and is locally worked as two distinct coals. The upper bench is 20 inches to 2 feet thick, and the lower bench locally measures 3½ to 4½ feet thick. Little is known of this coal outside of this area.

Cambria County.

Coals. The workable coals of Cambria County occur in the Allegheny group. Thin and dirty coals occur in the Pottsville and in the lower part of the Conemaugh group.

Structure. The eastern edge of the county follows in general the crest of the Allegheny Front. From this ridge the rocks descend sharply to the northwest into the Wilmore syncline, a descent of 1700 feet in 5½ miles. Viaduct anticline lies west of the Wilmore Basin, and Johnstown syncline west of the Viaduct anticline. The Wilmore syncline and Viaduct anticline die out in the northeast part of the county, and the dip is directly from the Allegheny Front into the Johnstown syncline. West of Johnstown the rocks rise 2000 feet in 3 miles to Laurel Ridge anticline. This anticline crosses the county in a northeast direction and forms a prominent ridge much of the distance. Barnesboro syncline crosses the northwestern part of the county with Nolo anticline still northwest of it.

Distribution of coals. In the northern part of the county the Upper Freeport coal is 39 to 44 inches thick in the Barnesboro-Patton area, not including a lower bench. Outside of that area it ranges from a feather edge to 4 feet. The Lower Freeport, the most extensively developed bed in the northern part of the county, ranges from 3 to 5 feet averaging close to 4 feet. It is characterized by a persistent binder 8 to 12 inches from the bottom and locally by a layer of bone at the top. Clay veins render it unmineable in places, roof rolls, knife blades and nodules of pyrite detract from its value.

The Upper Kittanning coal, 50 to 90 feet below the Lower Freeport, is mined at Hastings and Patton. At Patton it is 4 feet or more thick, including 2 feet of dirty coal which is not mined. Knife edges of pyrite are abundant in it, but the bed is free from clay veins and rolls. In general this bed is thin.

The Lower Kittanning coal, although below drainage in most of the northern part of the county, appears from drillings to be regular and probably mineable in the whole area. It averages about 38

inches thick, not including two underlying benches which together contain nearly 2 feet of coal. The coal has good quality.

The coals in northern Cambria County are rather deeply buried, and outcrop mainly where the anticlines cross the major drainage lines, as on Yellow Creek and on West Branch of the Susquehanna near Garman's Mills, in the center of the county, and along Chest Creek below Patton. They rise above drainage on the north edge of the county, and the rise to the Allegheny Front lifts them all above Clearfield Creek between Dean and Ashville. All of the coals in this part of the county are irregular in thickness and should be thoroughly tested with the drill before development. Over most of the area they will have to be reached by shaft.

In the Black Lick Creek district all of the coals rise above drainage from Vintondale eastward to Nant-y-Glo. Mining at Wehrum is by shaft. In this area the Upper Freeport coal is 3 to 3½ feet thick. It occurs in two benches separated by a small bony parting 1 to 3 inches thick. The Middle Kittanning has a thickness of 33 inches near Twin Rocks. The Lower Kittanning is the principal bed of the district, consisting of a main bench 3½ to 4 feet thick, underlain by one or two thin and irregular benches.

In the region around Johnstown the Upper Freeport, Lower Freeport, and the Upper and Lower Kittanning coals are workable. The Upper Freeport, or "Lemon," has a main bench 3 to 3½ feet thick underlain by 1 to 6 inches of bone and shale and that by 1 to 6 inches of coal. The Lower Freeport coal was not being mined in this district a few years ago, though along Stony Creek in places it has a thickness of 40 inches or more. The Upper Kittanning or "cement" coal is 3 to 5 feet thick in the Johnstown area. It averages between 3 and 3½ feet thick, but thickens to 5 feet along Stony Creek near Windber. The Lower Kittanning bed is below drainage at Johnstown and it is worked by slopes and shafts. It rises above drainage east, west, and south of the city. It has a main bench of about 3½ feet of coal below which is a lower bench of 14 inches, separated from the main bench by a parting 6 to 14 inches thick.

In the South Fork district the Allegheny coals rise above drainage just east of Ehrenfeld and at South Fork. The Upper Freeport coal here is in two or three benches, of which only the lower two, each 1 foot to 2 feet thick, are workable. The Upper Kittanning coal is 3 to 3½ feet thick. The Lower Kittanning or Miller bed, 160 feet below the Upper Freeport, the principal bed of this region, consists of a main bench 3½ to 4½ feet thick underlain by a lower bench 2 to 36 inches thick, below a parting of 1 to 15 inches. The Brookville coal has a thickness of 3½ feet near South Fork.

The southeast corner of the county is in the Windber district. Here the Allegheny coals are above drainage, but only one, the Lower Kittanning, is worked. The Upper Kittanning is a clean coal 4½ to 6 feet thick. The Upper and Lower Freeport coals have been but little prospected. The Lower Kittanning is a very high grade coal with low ash and sulphur. It is about 3½ feet thick not including a lower bench 3 to 8 inches thick lying 3 to 24 inches below the bench which is worked. It lies low in the hills and it is worked by drift.

In the Portage district the Upper Freeport coal is everywhere of good thickness, from 2 to 5 feet and averaging over 4 feet thick. The Lower Freeport coal is in general less than 2 feet thick here but is 3½ feet in a drill hole south of Llanfair. The Upper Kittanning is locally of value, having a thickness of 7 feet 2 inches on Trout Run, of which 3 feet 7 inches is in one branch. In the Sonman shaft it is 2 feet thick, in the Yellow Run shaft 2 feet 6 inches thick. The Middle Kittanning is generally thin, but is 2 feet 8 inches thick at Bennington, just east of the county. The Lower Kittanning or Miller coal is here, as in adjoining regions, a bed of unusual uniformity of thickness. It averages about 3½ feet thick and is mostly clean coal. Locally there is a maximum of a foot of bone at the top. The coal is relatively soft, very lustrous, and long grained. Less than 20 feet above the Lower Kittanning coal in this region there is a persistent bed of coal, the Bens Creek bed, that has a thickness of 3 feet 7 inches to 4 feet on Bens Creek.

The Mercer coal of the Pottsville appears to be workable locally, as at the Eleanor mine above Martindale.

The coals in the Wilmore basin are so deep that little is known of their thickness or quality. It may be assumed that they preserve the thickness and character they show in the South Fork and Portage areas.

Cameron County.

Coals. This county is mainly a high table land dissected by deep valleys 2,000 feet above sea level. The coal-bearing rocks are gone from the southeastern part of the county, but the lowest beds still cap the summits west of Stirling and north of Cameron. The basin which remains is only about 2 miles wide. Another small area exists on the highlands of the northeastern part of the county.

The Cameron field includes the Dagus (Lower Kittanning ?) coal which is about 3 feet thick. A bed which is locally 3 feet thick, lies 30 to 40 feet below the Lower Kittanning (Scrubgrass ?). The Clermont or Clarion coal, which is 3 to 4 feet thick, lies 80 feet below the Dagus bed. The Star (Mercer ?) bed lies under the Clermont a short distance. It is 2 feet 8 inches to 3 feet 3 inches thick, with a 1-foot rider above and is underlain a short distance

by 15 inches of coal. Still lower is the Marshburg bed (Sharon ?) which locally reaches a thickness of 30 inches.

Centre County.

Coals. The coal fields are all in the northwest part of the county. They lie northwest of the Allegheny Front in the first syncline, or First Basin of the old State Survey. There are two principal areas—one lying southeast of Moshannon Creek in Rush Township; the other in Snow Shoe and Burnside townships, extending northwest from Snow Shoe—and in addition some 14 detached areas of Allegheny rocks. These coal areas are surrounded and connected by a large area of Pottsville rocks which form the larger part of the northwest flank of Allegheny Mountain.

Distribution of coals. All of the Allegheny coals are present in the first of these coal areas. The Upper Freeport or "Cap" bed, is present in very small areas, and is thin but has good quality, averaging 3 feet or less thick. The Lower Freeport or "Moshannon" bed has a slightly larger area and is 2 to 5 feet thick. The Upper and Middle Kittanning coals, which are generally thin, are locally 3 feet or more thick. The Lower Kittanning because of its good thickness and large area is the principal bed. It generally occurs in three benches which are locally so far apart that one or more of them cannot be mined with profit.

The Brookville coal is generally 6 feet or less in thickness, but is generally much broken up with partings.

The Upper Freeport occupies a very small area in the Snow Shoe area. It is practically mined out. It is 2½ to 5 feet thick. The Lower Freeport is locally 6 feet thick, but in general is from 3 to 4 feet thick. The Upper Kittanning bed is usually a thick bed, 5 feet or more thick, including one or more partings. It is the "Big bed" of this area. The Lower Kittanning coal is locally 3 to 4½ feet thick. The Brookville coal is locally 3 feet thick. The smaller coal basins usually contain only the coals in the lower part of the Allegheny group.

Clarion County.

Coals. The coals of this county all belong in the Allegheny group. In the southern part of the county many small hilltops are capped by Conemaugh rocks but in the northern part of the county even the Allegheny coals are above the hilltops.

Structure. The rocks of Clarion County rise gently northwestward, and five or more gentle northeast-southwest folds vary the rise of the monocline.

Distribution of coals. The Upper Freeport coal, confined to some 50 hilltops along the southern border of the county, many of which are flat and broad, has a thickness of 18 inches to 5 feet not including bony benches. This bed averages approximately 3 feet thick.

The Lower Freeport coal has a larger area, but is a thinner coal. It is locally split by 1 to 2 feet of shale. Locally it is more than 5 feet thick.

The Upper and Middle Kittanning coals are of variable thickness. The Upper Kittanning is over 5 feet near Petrolia, 3 to 4 feet near New Bethlehem, 3 feet near Sligo, and averages about 2½ feet thick in the eastern part of the county. The Middle Kittanning is 30 inches thick near Bruin. At other localities it is thinner.

The Lower Kittanning coal is probably the most important coal in the county. It is not thick, but persistent and occupies a considerable area. It averages approximately 3 feet thick. A remarkably persistent binder of splinty coal occurs 6 to 12 inches below the top. In the northern part of the county an additional bed which is less than 2 feet thick lies 5 to 15 feet below this bed.

The Clarion coal is sulphurous and carries one or more binders, but it is locally 7 feet thick. It is the most valuable and persistent bed in the southwest part of the county but is of little value in the southeastern part of the county, where it averages only a little over 2 feet thick. In the northeastern part of the county it is thicker, many sections averaging over 3½ feet. In the southwest part of the county the bed is divided into two benches which are locally 30 feet apart. The Lower Clarion, ("Sulphur vein") 30 to 50 inches thick, is high in sulphur. The Upper Clarion has less sulphur and other impurities, but is generally not over 2 feet, although it locally thickens to 3 or 4 feet.

The Brookville ("Craigsville") is persistent but generally thin or broken up with so many partings that it has little value. Locally, as at Craigsville, Sligo, and northeast of New Bethlehem it is 3 feet thick. It is commonly high in sulphur.

Clearfield County.

Coals. Practically all of the coals of the county belong in the Allegheny group. The Lower Freeport coal has been in the past the principal source of supply in the first and third basins.

Structure. The coals of Clearfield County lie in three major synclines, formerly called the "First, Second, and Third" Basins. The "First", Houtzdale syncline or Moshannon basin lies between Allegheny Mountain on the southeast and the Laurel Ridge anticline on the northwest.

Northwest of this basin is the Clearfield syncline containing some minor folding, and is separated from the Punxsutawney syncline by the Chestnut Ridge or Driftwood anticline. A third anticline crosses the extreme northwest corner of the county. The axis of the Houtzdale syncline extends from Utahville through Houtzdale, to

Osceola Mills, and Phillipsburg. This basin contains the Moshannon Coal Basin, from which "Clearfield coal" was originally marketed. The coals of the second basin are as a rule thin. The third basin contains the Punxsutawney-Reynoldsville coal basin.

Distribution of coals. In the First basin the Upper Freeport ("E" or "cap seam") is generally about 3 feet thick. It has been mined but little in the past, but with the exhaustion of the thick Lower Freeport coal some mining is being done on this bed even over the old workings on the lower bed. Where it has been undermined it is considerably broken up, and is loaded with very little shooting.

The Lower Freeport coal ("D" or "Moshannon" coal) has been a valuable bed. It ranges from 4 feet to 9 feet, and averages approximately 4½ feet. It splits westward from Muddy Run. The two benches are locally 55 feet apart. The thick coal has nearly all been mined out and recent mining has been mainly on the lower bench, which averages but little over 2½ feet thick. The coal occupies a rather narrow belt and outcrops on both sides of the basin from Ramey northeast. West of Ramey this coal spreads out and rises under cover over Laurel Ridge anticline.

The Upper and Middle Kittanning coals are of good thickness in part of this area. Southeast of Houtzdale the Upper Kittanning bed has some cannel coal in it. The addition makes the whole bed 6 feet or more thick. It is nearly 3 feet thick around Morrisdale. West of Osceola Mills and at Blue Ball it is between 2½ and 3 feet thick. West of Phillipsburg and around Morrisdale the Middle Kittanning coal is 4½ feet thick. In general, however, these beds are thin or split.

The Lower Kittanning or B coal is a persistent bed 2½ to 6 feet thick. It is generally divided into three benches in the First Basin. These benches are locally close together and are mined together, but in other places, notably northwest of Irvona, the partings between them thicken up to at least 17 feet.

On Muddy Run and eastward, and in the vicinity of Coalport, this bed locally contains less than 6 inches of bony or shale. The bed is 6 feet thick and is split into two benches. At the Lula mine near Phillipsburg there is a considerable body of canneloid coal. Between Phillipsburg and Kylertown the Lower Kittanning is being work extensively. It is 3 to 4 feet thick exclusive of partings which are 4 to 8 inches thick at Morrisdale but thin out at Munson. Most sections of this coal show streaks of sulphur ½ inch or less in thickness.

The Brookville or A coal is 6 feet thick in part of this area, but it is commonly broken up by two or more irregular streaks of clay or shale and pyrite. In other parts of this basin this coal is generally thin.

Laurel Ridge anticline lifts the rocks so that along much of the crest all of the Allegheny coals have been eroded, or only the lower beds remain. In places along this fold, as near Burley, the Mercer coal locally exceeds 2 feet in thickness, but is mined but little, although the flint clay underlying it is mined at many places in Woodward and Decatur townships.

The Second Basin occupies a broad band across the county from southwest to northeast. In general the coals in this basin in this county are relatively thin. In much of the area none of the beds are 4 feet thick, and only one or two are 3 feet thick. In parts of this belt none of the beds are even that thick. In the southwest corner of the county all of the coals appear to be thin, but locally, as at Burnside, Lajose, and other towns, the Upper or Lower Freeport are 3 feet thick or over. Along Susquehanna River from Curry Run to Clearfield and beyond the Upper Freeport is generally over 2 feet thick and the Lower Freeport 3 feet thick or more. At Grampian the Lower Freeport is 5 feet thick. At Clearfield the Middle Kittanning coal is over 3 feet thick and is sulphurous. In the Karthaus region the Lower Freeport coal is locally 6 feet thick and the Lower Kittanning coal locally 4 feet thick. In places around Clearfield and elsewhere the Brookville coal and Homewood sandstone are replaced by shale containing six or more thin irregular coals in a space of 60 feet.

Chestnut Ridge anticline in the western part of this county, although raising the coals as high as the Laurel Ridge anticline, is accompanied by a higher ridge so that along most of its crest all or nearly all of the Allegheny coals have been preserved and continue unbroken over the anticline. Approaching Anderson Creek from the southwest the axis of the anticline rises and eroson has removed most or all of the Allegheny group and the crest of the broad divide is formed by the massive Pottsville sandstones. This series continues to the northeast corner of the county.

The Punxsutawney syncline or "Third basin" lies northwest of the Chestnut Ridge anticline. In the main the coals of this basin in this county are below drainage although they rise to daylight at the northeast. This is a northeastward continuation of the Reynoldsville-Punxsutawney basin where the principal coal is the Lower Freeport or D. The little data in hand on the coals of this basin in this county indicate that in the southwest part of the basin, the conditions are similar to those around Reynoldsville. The Lower Freeport coal is the principal bed. Locally it is 6 or 7 feet thick, but is subject to replacement by sandstone; the Upper Freeport coal is of uncertain thickness, locally it is 4 feet thick but is widely cut out or reduced in thickness; the Lower Kittanning is 3 feet or more thick,

and the other beds are generally thin. The coals in Huston Township are not so deeply buried, but so far as is known they are thinner than they are to the southwest.

Clinton County.

The Coal Measures of this county are confined to three lines of remnants capping the hilltops in northeast-southwest directions. These remnants include only the lower part of the Allegheny group up to and including the Lower Kittanning coal. All the bodies of coal are small. In the Renovo coal basin 5 coal beds have been found, including the Lower Kittanning, 4 feet thick, at the top, the Clarion or Clermont, 3 feet thick, the Upper Alton 4 feet thick, the Lower Alton 3 feet thick, and a one-foot bed below the Lower Alton. In Noyes Township the Clarion has a thickness of 5 feet, but it is not persistent. In West Keeting Township the Lower Kittanning and Clarion coals are both 3 feet thick in small area.

Crawford County.

Crawford County is practically lacking in workable coal. The Allegheny coals have all been removed and the only coal remaining in the county is the Sharon which is found in the summits of southern townships of the county. This coal is locally 4 feet thick, but is so variable in thickness, or has such thin cover that it has little or no value.

Elk County.

Coals. The coal-bearing rocks of Elk County lie nearly flat, capping the higher parts of the plateau along four lines, where they are preserved in four minor synclines.

Structure. The first of these synclines follow Bennetts Branch of the Susquehanna past Caledonia and Benesette; the second, a northeastward extension of the Reynoldsville basin, runs through Shawmut, Brockport and on along Little Toby and Elk creeks; the third passes Lake City, Ridgway, Mt. Moren, and northeastward; the fourth syncline follows the same general direction through Spring Creek Summit and Highland. The flatness of the beds and of the plateau summits results in the preservation of a considerable body of the coals, particularly of the lower beds which are estimated to cover half of the county.

Distribution of coals. The Upper Freeport coal is thick, locally 6 feet, but generally occurs in two benches each of which is 3 feet thick, and are separated by 6 to 20 feet of shale. Its area is small and confined to the south part of the county. The Lower Freeport coal, occurring only in the second basin, as described above, is 3 feet

to 4 feet 6 inches thick, generally without partings. The Upper and Middle Kittanning coals are locally 3 feet thick or more, and may yield considerable workable coal. The Lower Kittanning coal or Dagus coal has been extensively mined. It ranges from less than 3 feet to near 4 feet thick, and averages about 3 feet. In the St. Marys basin it averages 3 feet 4 inches, and is locally 4 feet thick. In the northern part of the county it ranges from 2 feet 6 inches to 3 feet 2 inches thick.

The Clarion or Clermont bed is 4 feet thick or more locally, but in general it contains 3 feet or less of coal in two benches separated by 4 to 13 inches of shale. This bed and the Alton (Mercer?) coals contain the best coal in the eastern part of the county. On Toby Creek, near the southern boundary of the county, however, the Clermont coal is 2½ to 3 feet thick.

The Upper Alton coal is 2½ feet thick at St. Marys; 2½ to 4 feet north of Benezette; in Fox Township it is 3 to 4 feet thick; near Irwins Mill 4 feet 5 inches, and 3 feet in northern Elk County. The Middle Alton coal is 2 to 4 feet thick near Benezette, 3 feet 10 inches on Spring Run, 3½ feet at Weedville. The Lower Alton coal is 3 feet thick, but of little value at St. Marys; 3 feet in Fox Township, and 4 feet thick in northern Elk County near Irwins Mill. It is generally too dirty to be of value at present.

Fayette County.

Coals. Fayette County is the leading bituminous coal-producing county of Pennsylvania. It contains nearly all of the bituminous coal horizons which are of value in other counties in the State.

Structure. Two major anticlines cross the southeastern part of the county and coincide with Laurel Ridge at the east and Chestnut Ridge at the west. These expose the lower coal horizons and considerable areas of the underlying rocks. Northwest of Chestnut Ridge the structure is gentle and the Pittsburgh coal and the overlying rocks underlie a wide belt running from Smithfield past Uniontown and Connellsville; a second broad belt runs more nearly north and south along the east side of the Monongahela River. The first of these belts contains the famous Connellsville coke district.

Distribution of coals. The Pittsburgh coal in this basin has the typical section described under Allegheny County. The roof division is a few inches to 5 feet thick, and has little value. The main division ranges from 8 to 11 feet thick, with but one small bearing-in slate about 18 inches from the floor. Compared with the district around Pittsburgh, the coal is softer, easily mined, and poorly adapted for shipping, but admirably suited for making coke.

Near Monongahela River the roof coal is thin, the main clay is about 1 foot thick and the main division from 7½ to 9 feet thick, divided into benches as in Allegheny County.

The Redstone has a thickness of from 3 to 5 feet in many places in the Uniontown syncline, but elsewhere it is thin or represented by only a few inches of black shale.

The Sewickley coal, as shown by shaft sections and drillings, is very irregular, lacking in some sections, while in a few places as at Fairchance, it is at least 5 feet thick. Generally, however, it is thin.

The Uniontown coal is 3 feet thick at Uniontown, and 4½ feet in the Leith shaft. In general, however, it is thin or wanting.

The Waynesburg coal is 3½ feet thick in the Uniontown syncline. To the west it is thicker but is split up with clay partings. Single benches, where thickest, range from 2 to 4½ feet.

The Waynesburg A is 4 feet thick at Edenborn, and 4½ feet on Middle Run. It may have some value in the future. The Washington is of variable thickness, and locally is 6 feet thick, but it is generally broken up with partings so that its value will probably fall below that of the Waynesburg A coal.

The Allegheny coals are brought to outcrop by the anticlines in the eastern part of the county. In this part of the county the Upper Freeport coal is of importance, and is locally from 10 to 16 feet thick. Not more than 9 feet is coal and generally much less, the coal being separated into benches from a few inches to nearly 4 feet thick by clay partings having a thickness of a few inches to 2 feet.

The Lower Freeport coal is generally worthless in this area although it locally contains more than 2 feet of high ash coal. The Upper Kittanning coal is nearly 6 feet thick on Cucumber Run, including 4 inches of clay near the middle. In general it is thinner and is broken into two or more benches by clay partings 1 inch to 5 feet thick. The Lower Kittanning coal is not important in this district, although on Chaney Creek it is from 4 to 6 feet thick. The Brookville-Clarion coal, lying 15 to 30 feet above the top of the Pottsville sandstone, is 2 to 4 feet thick near Ohiopyle, and 8 feet 5 inches thick at Cool Spring Furnace, east of Uniontown. Numerous large blooms indicate that this bed may be workable in a considerable area. The Mercer coal is 4 feet thick on the east side of Chestnut Ridge near the National Pike. Generally it is less than 2 feet thick.

Forest County.

Only the base of the flat lying Coal Measures remain in this county, forming the flat top of the plateau, which is deeply trenched by the streams. The coal in the county is very limited in area and of little value. A few of the highest hills hold the Clarion coal, which at one point is 2 feet 3 inches thick. One or two coals locally 3 feet thick represent the Mercer group. The Sharon coal (Upper Marshburg bed) is 3 feet thick, either split or shaly.

Fulton County.

About 8 square miles of the southeastern part of the Broad Top Coal Field lie in Fulton County. This field is discussed under Bedford County. In addition to the workable beds in the main field there are a number of thin worthless beds of coal in the Pocono sandstone which underlies the coal field.

Greene County.

Coals. This county is probably all underlain by the Pittsburgh bed except a few square miles in the southeastern corner where the coal rises to outcrop. The other coals of the Monongahela group underlie all but the eastern edge of the county. The coals in the lower part of the Dunkard series underlie most of the county. Little is known of the coals below the Pittsburgh coal, except that some of the oil and gas drillings find a coal about in the position of the Upper Freeport suggesting that that coal may prove of value in the future.

Structure. The county is crossed in a general northeast-southwest direction by a number of anticlines and synclines forming a series of waves that reach their lowest point in the Nineveh syncline in which the Pittsburgh coal is only 100 feet above sea level and more than 1,000 feet below the surface.

Distribution of coals. No accurate measurements of the Allegheny group coals have been obtained. The Pittsburgh coal has a thickness of 6½ to 7½ feet not counting the roof coal which is about 1 foot thick. It is thought that the Pittsburgh coal maintains a good workable thickness under practically all of the county. During recent years it has been found that the Pittsburgh coal in Greene County has good coking qualities, so that today much of it is in the hands of the large iron companies as a reserve for the future production of coke.

Of the other coals of the Monongahela group the Sewickley has a thickness of 4 feet on Dunkard Creek, but elsewhere, so far as known, it is thinner, probably averaging less than 2 feet. The Waynesburg coal is generally thick, averaging from 5 to 7 feet, and is locally 9 or 10 feet. It generally occurs in three benches separated by thick partings.

The Washington coal and the Waynesburg A and B coals are thin in this county, and only locally have a thickness of 2 feet.

Huntingdon County.

This county contains the northern end of the Broad Top Coal Field. This coal field was described as a whole under Bedford County, and reference is made to the description of the coal in that county.

Coals. The surface rocks of this county are mainly Conemaugh in age. The Monongahela group occurs in Elders Ridge in the southwest corner of the county and the Allegheny group outcrops over broad areas along the crest of Chestnut Ridge anticline and in a few of the valleys elsewhere.

The Pittsburgh coal occupies a basin about 9 miles long by 3½ miles wide underlying the crest of Elders Ridge. The coal averages 7 feet thick. Some of it is clean, but partings are common. It is 10 feet thick including the roof coal.

The Upper Freeport is the most valuable of the Allegheny coals in this county. In parts of the county this bed is regular and persistent and elsewhere it is extremely irregular, having been eroded after deposition and later replaced with sandstone. It is about 3½ feet thick in the northwest corner of the county, lacking south of Punxsutawney, 3 to 5 feet thick at Rossiter and to the east. In the Glen Campbell district it is 3 to 5 feet thick, and to the southwest of Richmond it is 5 feet thick. It is extensively mined in the Indiana district where it is 5 to 7 feet thick in considerable areas. As a rule it is in two benches. The lower bench is the thicker, and is separated by 4 to 10 inches of shale. The upper bench ranges from 1½ to 2½ feet; lower from 2½ to 4 feet.

The Upper Freeport coal underlies most of the county and is generally workable, so practically no mining has been done on the underlying coals except where they outcrop. In general the Lower Freeport coal is irregular in thickness, is thin and worthless in large areas but reaches a local thickness of 16 feet near Glen Campbell. At Glen Campbell and southwestward it is generally workable. and is locally 5 feet thick. In general it is between two and three feet thick. It is workable locally south of Richmond where it is 3½ to 4½ feet thick. In general, however, it is thin in all the area about Indiana. Further southwest it is 5 feet thick on Neal Run near Jacksonville, but elsewhere it does not measure more than 2 feet.

The Kittanning coals are below drainage under most of the county. Near Deckers Point the Upper Kittanning is 3 to 5 feet thick and is overlain locally by cannel coal with a maximum thickness of 9 feet. In general, however, this bed appears to be thin and of little or no value. The Middle Kittanning coal is not known to be of value in the county. The Lower Kittanning coal appears from drillings and a few exposures to be generally thin, commonly between 2 and 3 feet with some areas below 2 feet and local areas where the bed is over 3 feet thick. In the northeast corner of the county the Brookville coal has a thickness of 4 feet or over at a number of places, but it is usually somewhat shaly.

JEFFERSON COUNTY.

Structure. According to the reports of the Second Pennsylvania Geological Survey the rocks of this county lie in six parallel synclinial basins separated by long straight anticlines. Detailed work will doubtless relocate the local position and direction of these folds. These folds become less pronounced but higher toward the northwest so that in the southeast part of the county the surface rocks are mainly of Conemaugh age. In the central part of the county the rocks are of Allegheny age, and in the northwest townships Pottsville rocks form the surface.

Distribution of coals. The Upper Freeport, although usually present within its line of outcrop, has proved of value only in the southeastern part of the county. In Bell and Gaskill townships it is persistent and generally 3 to 4 feet thick. In the Punxsutawney Basin it is 4 feet thick at many places but is not persistent and not always of good quality. In the south central and southwestern parts of the county it is thin and irregular and of little value. At Reynoldsville it is 4 feet thick in places but as in the Punxsutawney area it has been subjected to subsequent erosion and replacement. In the northeast part of the county its quality improves but it is thin.

The Lower Freeport coal is the most valuable coal in the county. The Lower Freeport is thin in the southeast corner of the county but thickens as it descends into the Punxsutawney-Reynoldsville Basin where it has a fine thickness and has long been mined. Here the coal is 4 to 10 feet thick. Measurements of 5 and 6 feet are common. At Adrain, Walston, and Elk Run it averages about 5 feet 6 inches. Toward Big Run and Eleanora it is thinner, ranging from 4 to 4½ feet. At Eleanora shaft it is 10 feet or more thick. In the Reynoldsville area the bed ranges from 6 to 10 feet including one or more partings. Locally it is 14 feet in thickness with two partings 6 and 7 inches thick. The coal in this whole basin is locally lacking, owing to extensive post-Allegheny erosion. Some of these old erosion channels are nearly a mile wide. The Lower Freeport is not as thick elsewhere in the county as in the basin just described, but it is reported to be generally of workable quality within the limits of its outcrop.

The three Kittanning coals are of little value in this county. The Upper Kittanning is everywhere under 3 feet in thickness and is generally not more than half that figure. The Middle Kittanning coal is thin in much of the county, but in Union Township it is about 3 feet thick and is the best bed in that township. In Knox Township it is 2 to 4½ feet thick and in McCalmont Township it has a local thickness of 6 feet. The Lower Kittanning bed is regular and persistent but it is generally thin and has poor quality. It is 3 feet thick in many parts of the county but is generally less than that.

It has been worked in a small way at many places as a fuel for burning the Vanport limestone which underlies it a short distance. The Brookville coal is a coal of fair thickness all over the county, but is generally of poor quality. In Beaver Township it ranges from 4 to 5 feet thick, is 5 feet thick in Clover Township and elsewhere. The Mercer interval contains two or locally three coals, the uppermost of which is 2½ feet thick in places and locally in Pine Creek Township it is 9 feet thick including 2 feet of partings.

Lawrence County.

Coals. The Allegheny group forms the surface under most of the county but is cut out in most of the valleys and is entirely gone from the northwestern edge of the county.

Structure. The rocks of Lawrence County lie nearly flat but have a slight rise to the north. The Conemaugh group is confined to the hilltops in the southern part of the county.

Distribution of coals. The Mahoning (East Palestine) coal is 4 feet thick in the southern part of the county in a very small area. The Upper Freeport coal, which is normally 4 or 5 feet thick, is locally 6 feet in Little Beaver Township. The Lower Freeport coal is locally workable but generally it has no value. The Middle Kittanning or Darlington coal ranges from 2 to 4 feet in thickness and is locally good coal. In the southwest corner of Plain Grove Township it is a block coal 4 feet thick. The Lower Kittanning coal is not well known. It is underlain by a thick bed of clay and will doubtless be worked with the clay. Locally it has a thickness of 3 feet but is generally less. It is free from persistent partings. The Pottsville coals are generally too thin to be of value in this county, but a few miles east of Edenburg the Upper Mercer is a block coal 5 feet thick. The Quakertown coal is 2 feet thick at the falls of Quakertown Run. The Sharon coal is thin in this county.

McKean County.

This county is topographically a high plateau, the higher parts of which are capped by the lower half of the Allegheny group. The scattered remnants of this group contain small areas of the Lower Kittanning (Dagus) coal about 3 feet thick, and larger areas of the Clarion (Clermont) coal also about 3 feet thick. Locally, as in Lafayette Township, it is nearly 6 feet thick. The Mercer coals, known as the Alton coals, cover much larger areas and have a greater thickness than the higher coals. There are 3 beds, the upper is 2 to 3½ feet thick, the middle bed 4 to 8 feet thick, and the lower bed about 4 feet thick. Locally the upper bed is 5 feet thick. The middle bed generally has partings that greatly reduce its value.

A $2\frac{1}{2}$ foot bed in Norwich may represent the Sharon coal. The fact that, notwithstanding the distance of McKean County from other sources of supply, none of these coals is being mined indicates that the coals are probably of little value or that the thick coal has all been mined out.

Mercer County.

The coal-bearing rocks of this county include the Pottsville series and the basal part of the Allegheny group. The Allegheny rocks are confined to the higher land in the southeastern and eastern parts of the county. Geologically the highest coal is the Scrubgrass which underlies the Vanport limestone, and is generally less than 1 foot thick. The Brookville or Clarion coal, 40 to 70 feet below the limestone and 3 to 5 feet thick, has been extensively mined in Findley, Jackson and Lake townships. It is locally known as the Pardoe coal. It has been reported to be in twenty-one isolated areas on the knobs and high divides in the southern and eastern part of the county.

The two Mercer coals near Mercer are locally 4 to 7 feet thick, of very impure coal, and generally they are of little value.

The Sharon coal has been valuable in the western part of the county but is thin and worthless east of Mercer. In the western townships it underlies only the more elevated portions of the county. Millions of tons have been mined from this bed in Hickory Township, the bed measuring from 6 inches to 4 or 5 feet in thickness.

Potter County.

This county is crossed from southwest to northeast by a number of synclines within which the basal sandstones of the Pottsville make broad table lands. The highest summits catch three coals of which the middle bed, probably the Sharon, contains a few acres of 3 foot coal.

Somerset County.

Coals. The Coal Measures of Somerset County lie in four basins trending nearly north and south, and are contained in the Monongahela, Conemaugh, anad Allegheny groups.

Structure. The Wellersburg basin, lying east of the Allegheny Mountains, the Salibury-Berlin basin, the Somerset-Wilmore basin, and the Johnstown basin, are the principal structures in the county. The first two basins contain small areas of the Pittsburgh coal.

Distribution of coals. The Wellersburg basin contains a few hundred acres of Pittsburgh coal in the hills north of Wellersburg. This is an outlier from the Frostburg field of Maryland. The Allegheny group in this basin contains three main coals, probably representing the Upper Freeport, Lower Freeport, and Lower Kittanning.

These beds are 4 to 5 feet thick locally, but in general they are less than 3 feet thick.

The Salisbury basin originally contained about 3,600 acres of Pittsburgh coal. The coal ranges from 6 to 9 feet thick with irregular partings. It is thinner in the Berlin area where it was formerly called the Pine Hill No. 2 bed. About 25 feet above the Pittsburgh bed is a 4 foot bed being vigorously mined south of Meyersdale. In this basin, as in the Wellersburg basin, only three of the Allegheny coals are of importance, the Upper Freeport, Upper Kittanning, and Lower Kittanning. The Upper Freeport in the few sections in which it is known has a thickness of from 3 feet to 3 feet 10 inches with an average of about 3 feet 6 inches. The Lower Freeport is hardly more than 30 inches thick in this basin, although at Garrett it averages 2 feet 8 inches to 3 feet of coal in one bench. The Upper Kittanning coal is nearly 3 feet thick everywhere in this basin. Locally it is 7 to 8 feet thick, much of which is shale partings. Sections of the Lower Kittannig coal show a main 3 foot bench underlain by two benches 4 to 8 inches thick with partings of 1½ to 3 inches thick.

The Berlin-Salisbury basin contains a larger quantity of workable coal of Conemaugh age than other similar areas in the State. The Lower Bakerstown (Thomas) coal is 1 to 4 feet thick; the Upper Bakerstown (Bakerstown) averages about 2 feet thick east of Negro Mountain; the Barton coal, although it averages only 1 foot of good coal locally, is 3 feet thick; the Wellersburg coal, which has a thickness of 5 feet at Wellersburg is thin west of Allegheny Mountain. The Lonaconing coal (Elk Lick coal of Rogers) is very thin except on Elk Lick Creek, where it is 4 feet thick. The Little Pittsburgh coal is nearly 3 feet thick near Wellersburg.

In the northern part of the county, all of the Allegheny coals are locally mineable. The Upper and Lower Kittannings are the most important beds. The Lonaconing is locally 4 feet thick in the Johnstown basin, the Harlem coal 10 to 30 inches, and the Bakerstown coal 1 to 1½ feet thick.

The Upper Freeport is 2½ feet to 6 feet thick. The thickest coal is in Jenner, Conemaugh, Lincoln, Somerset and Quemahoning townships. The Lower Freeport averages about 3 feet, ranging from 2 to 4 feet thick. Its best development is in Somerset and Quemahoning townships. The Upper Kittanning bed ranges from less than 3 feet to 7½ feet thick. It is best developed west of Stony Creek, principally in Jenner and Conemaugh townships. The Middle Kittanning coal is generally less than 2 feet thick and is not mined. The Lower Kittanning ranges from 2½ to 5 feet thick, and averages about 3½ feet. Its good quality and thickness has led to its being mined on a large scale in Conemaugh, Paint, Shade, and Quemahoning townships. The Clarion coal averages 2½ feet thick, and locally is 4 feet

thick. It is usually high in sulphur and bone. The Brookville is both thick and persistent (averaging 5 feet), but its value is greatly reduced by partings of shale, bone, and pyrite.

The coal in this county has been developed more slowly than some of the adjoining counties. It has today one of the largest reserves of low-volatile coal in the State.

Tioga County.

Two synclines cross this county running a little north of east, and south of west. The northern one crosses a little north of the center of the county and contains only a few acres of coal-bearing rocks in about three areas. In Gaines Township is the Gaines coal field containing what is left of the so-called "Three foot," "Four foot," and "Five foot" coal beds lying nearly flat and 1,000 feet above Pine Creek and Long Run.

The southern syncline contains the famous Blossburg coal basin. This basin is about 16 miles long by 4 miles wide. About 300 to 400 feet of coal-bearing rocks remain in this basin and have at least 9 coal beds 2 feet to 5 feet in thickness, with benches of cannel-like structure having 12 to 16 per cent ash. In the eastern part of the Blossburg basin the uppermost coal, the Seymour bed, (Upper Freeport?) is 2 feet 8 inches thick. The next three beds are of less value. The Bloss bed, correlated with the Lower Kittanning coal, ranges from 3 feet 4 inches to 5 feet in thickness, averaging about 4 feet 6 inches. Locally it has no persistent parting, but generally it is broken into as many as four benches by thin partings. The Bear Creek bed occurs 20 to 40 feet below the Bloss bed and is 2 to 3 feet thick in places but it averages nearly 18 inches in the region.

In the Arnot sub-basin the Seymour bed has been worked where it is 2 feet 8 inches thick. The Bloss bed is regular in thickness with an average of about 3 feet 6 inches of clean coal, divided into four persistent benches.

In the Antrim sub-basin some of the beds are lacking. The Seymour bed is 5 feet 6 inches thick but is high in sulphur. The Bloss bed is 5 feet 4 inches thick although it is locally thinner. It has good quality, however. The development of Blossburg coal began in 1832, when a survey was made for a railroad from Blossburg to the New York State line.

Venango County.

Coal in this county is confined to some 26 patches of Allegheny rocks in the top of knobs in the southern part of the county. These knobs generally contain a few acres of the Clarion and Lower and Middle Kittanning coals. The principal bed is the Clarion which has been mined on a small scale for coal for running oil well pumps.

Warren County.

The coal-bearing rocks of this county consist of the basal sandstones of the Pottsville only, which form a cap for the highest uplands of the southern half of the county. Associated with these rocks is the Sharon coal and possibly a higher coal. The Sharon coal, although only 2 feet thick, has furnished considerable coal for local use.

Washington County.

Coals. The rocks outcropping in this county include the Ames limestone in the middle of the Conemaugh group to the base of the Greene group in the middle of the Dunkard series. The principal coal beds outcropping in the county are the Pittsburgh, Redstone, Sewickley (Mapletown), Waynesburg, Waynesburg A, and Washington. The Pittsburgh bed is the only one mined extensively for shipment. The coals will be described from the bottom up.

Structure. The structure of this county is not pronounced. The Nineveh syncline crosses the center of the county from north to south tending northeast-southwest. The beds have a general dip toward that axis from either side. A short distance east of the Nineveh syncline is the Amity anticline, east of that following Pigeon Creek is the Waynesburg syncline, and the Belle Vernon anticline crosses the southeast corner of the county. West of the Nineveh syncline come the Washington anticline, Finney syncline, Claysville anticline, and West Middletown syncline. In general the dip from one of these axes to the next is not over 200 feet, and between several of them not over 100 feet. In the southeast corner of the county the structure contours have quite definitely a northeast-southwest course. In the northwest corner of the county the structure contours have a general trend nearly east and west, the beginning of the general monocline to the northward which is characteristic of all northwestern Pennsylvania.

Distribution of coals. The Harlem coal, lying just below the Ames limestone, outcrops in the northwest corner of the county. It is 18 inches or less thick. The Barton coal, 15 to 30 feet above the Ames, is locally workable. Near Murdocksville it is about 3 feet thick, and has been opened at several places. The Little Clarksville or Bavington coal, lying about 100 feet below the Pittsburgh bed, is of good thickness at Bavington, where it abruptly thickens from a knife edge to 5 or 6 feet. It is also thick enough for commercial mining southwest of Frankfort.

The Pittsburgh coal underlies all of the county except the northwest corner and some of the stream bottoms. From these outcrops it descends to 1,000 feet below the surface in the southern part of the county. The coal is typically in two parts, a main division and

a roof division. The latter is 6 inches to 5 feet thick. In places it is a solid bed 2 to 3 feet thick; but generally it is so split up with partings that it has no value. The roof coal is generally separated from the main coal by 4 inches to 1 foot of main clay. In the northwestern part of the county the roof coal is separated from the main coal by 8 to 24 feet of shale and clay. It is mined in that area as the Pittsburgh rider or Rooster seam. The main division of the bed is 5 to 6 feet thick. In some places it is less than 5 feet thick, and in others it is 6 feet 6 inches thick. It has the usual bearing-in bands 2 to 3 feet from the bottom. The bearing-in bench between them is 1 to 2½ inches thick.

The Redstone coal, lying 50 to 80 feet above the Pittsburgh coal, is of little value in the northern part of the county. It is workable locally in the central part of the county, and in eastern Washington County it is persistent, and is 4 feet thick in many areas. The Sewickley coal is generally thin or is represented only by black shale. Locally it has a thickness of 28 inches. The Uniontown coal is thin almost everywhere. If it has mineable thickness numerous partings of clay destroy its value. The Waynesburg coal, lying 290 to 350 feet above the Pittsburgh coal, outcrops in the northern and eastern part of the county where it is thin, but lies deep in the southwest part of the county where it is 3 to 7 feet thick. Where it is thick there are generally three benches of coal; a typical section is as follows: coal, 3 inches to nearly 2 feet; clay, 12 to 18 inches; coal, 2 to 3½ feet; clay, ½ to 12 inches; coal, 15 to 30 inches. This bed is greatly inferior to the Pittsburgh bed in quality. It is a hard block coal of no coking value and usually contains a high ash and sulphur. The Waynesburg A and B coals are thin persistent coals of no value in this county.

The Washington coal is thick in this county, having a general thickness of 7 to 8 feet. It is composed of 6 inch layers of coal and shale in the upper part and of 2½ to 3 feet of solid coal in the lower part. The few analyses available indicate that it is a low grade coal similar to the Waynesburg coal. The Tenmile coal is of local value near Tenmile, where it has a maximum thickness of 38 inches.

Little is known concerning the Allegheny coals in this county. Churn drill records report 3 to 11 feet of coal at the approximate position of the Upper Freeport. Some wells report other coals still below that horizon which may represent the Kittanning coals.

Westmoreland County.

Coals. Westmoreland County vies with Fayette County as a leading coal-producing county. These two counties produce nearly one-third of the bituminous coal mined in the State. In 1913 this county

produced about 1/14 of all the bituminous coal produced in the United States, and more than 1/42 of all coal produced in the world.

The bulk of this coal output comes from the Pittsburgh bed which lies in five synclinal basins crossing the county from northeast to southwest, separated by four anticlines and bounded by two others. These will be described from the southeast to the northwest.

Distribution and structure. The southeast county boundary follows Laurel Ridge, from which all of the coal-bearing rocks have been removed. The Allegheny coals outcrop along its lower flanks. West of this ridge is the Ligonier basin, a wide valley in which the surface rocks are mainly of Conemaugh age. About 2,000 acres of the Pittsburgh coal have been preserved in the northern part of the basin in a long high ridge and in some isolated hilltops. The Pittsburgh bed in this basin is 7 to 8 feet thick with one or two local partings. The Allegheny coals underlie and outcrop on each side of the basin. The Freeports are the only beds which may have future value. The Upper Freeport along Laurel Ridge is split by thick clay partings but is 3¼ to 4 feet thick and clean near the Loyalhanna, in Ligonier Township. It is 5 to 7 feet along the base of Chestnut Ridge. It is said to be soft and sulphurous and not a good shipping coal. The dip of the beds in this region is locally as high as 80°. The Lower Freeport coal is locally 3 feet 6 inches thick in Mt. Pleasant Township but is not regular and is an uncertain bed farther north. The Upper Kittanning coal is 5 feet thick where mined in St. Clair Township but is less than 18 inches along most of its outcrop. The Lower Kittanning coal is absent along Chestnut Ridge but is present along Laurel Ridge where it is a very regular bed 3½ to 4 feet thick. In all pits it is hard coal in the upper bench and soft, prismatic coal in the lower bench. It is high in ash and sulphur. The Clarion or Brookville coals are rarely exposed, but one of the beds is 3½ feet thick on Meadow Run, and one is 5 feet 5 inches on Indian Creek.

West of Chestnut Ridge is the long, narrow, straight Blairsville basin in which is contained an area of Pittsburgh coal, 20 miles long, 3 miles wide at the north and 5 at the south. This basin is deeper than the Ligonier basin and contains a much larger body of Pittsburgh coal. The Allegheny coals have been tested but little. They outcrop on the west flank of Chestnut Ridge and underlie the whole basin. The coal of the Upper Freeport and Brookville beds is of very good quality and is almost as clean as the Pittsburgh coal, although it contains more sulphur. The Upper Freeport bed especially is probably workable in a large part of the basin. It is 2 to 5 feet thick on Big Sewickley Creek, and on the Little Sewickley is 10 feet 6 inches including a 2½ foot parting. On the Loyalhanna

and Conemaugh it is 3½ to 5 feet thick on the Saltsburg axis, and 4 to 8 feet thick on the Murrysville axis. The Lower Freeport coal is generally absent in this basin although it is 3 feet 10 inches thick including partings in Springhill Township and 2½ feet at Dunbar furnace. Little is known of the lower coals although a bed 4 feet thick has been found in Springhill Township. Typical sections of the Pittsburgh bed in this basin show uniformly about 8 feet of coal, not counting the roof coal which is 4 inches to 5 feet of coal and clay. The main division is separated into two to four benches by ¼ to ½ inch partings.

The Greensburg basin contains a body of Pittsburgh coal 12 miles long by 4 miles wide, and a few detached areas north of the main area. The Pittsburgh coal in this basin is 6 to 8 feet thick not including the top coal. It has no regular partings. This basin includes a small area of mineable Waynesburg coal. Other Monongahela coals are present and have minable thickness and quality locally. The Upper Freeport is lacking under Greensburg, but is present southward. The Kittanning coals are reported in some wells but lacking in others. Locally several of the Conemaugh coals are mineable, especially the Mahoning.

The Irwin or Lisbon basin originally contained a great body of Pittsburgh coal but mining has almost exhausted it. The Redstone has a maximum thickness of 4 feet, the Sewickley 3 feet, the Uniontown coal 3 feet, and the Waynesburg coal 3 feet. Still higher are found small areas of the Washington coal 4 to 9 feet thick but of poor grade, and containing many shale partings. As a rule these coals are thinner than the thickness given above and are inclined to be of very low grade or are broken up with partings. All of them vary in thickness within short distances.

The Pittsburgh bed is a large and merchantable bed of great regularity throughout the entire basin. Locally much coal has been lost through its removal before the laying down of the Pittsburgh sandstone. Sections of the coal show from 2 to 4 feet of top coal; 8 to 15 inches of main clay; 6 feet to 8 feet 6 inches of main coal. The top coal is generally composed of alternating layers of coal and clay. A few sections show solid coal from 2½ to 4 feet thick. The main coal has a typical section, consisting of 3 to 5 feet of breast coal at the top, 3 to 5 inches of bearing-in coal, 12 to 14 inches of brick coal, and 12 to 18 inches of bottom coal.

The Allegheny coals are rather deeply buried under most of this basin. Because of the importance of the Pittsburgh coal they have been but little explored. The Upper Freeport and possibly some of the other beds will yield considerable coal in the future. The Upper Freeport coal is absent at Irwin and northward but is present south of Irwin where it is locally nearly 8 feet thick. The Kittanning coals are reported in drillings in a few places.

The fifth basin which crosses the northwest extension of the county is so shallow that the Pittsburgh bed is caught in only some six hill-tops in that area.

The Freeport coals, notably the upper bed, are mineable under most of the northwest corner of the county. The upper coal is very regular, ranging from 2 to 7 feet thick, and averages 4 feet thick.

TONNAGE OF COAL IN PENNSYLVANIA.

Compared with that in other States. There is a widespread belief that Pennsylvania excels all other States in the quantity of coal she possesses, or did possess when mining began. This belief doubtless has arisen because of the enormous production of coal in Pennsylvania as compared with that of other States. Figures show that for many years Pennsylvania produced 60 per cent or more of all the coal produced in the United States, and now leads all States in the production of coal. In 1923, for example, Pennsylvania produced 171,879,913 tons of bituminous coal out of a total production of bituminous coal of 564,564,662 tons in the United States, or roughly one-third. (These figures do not include anthracite). In that year her nearest competitor was West Virginia with 107,899,941 tons; Illinois was third with 79,310,075 tons. It is therefore hardly to be wondered at that the impression should arise that this State abounds in coal. The best estimate of the coal resources of the United States is by M. R. Campbell of the U. S. Geological Survey, and made for the Twelfth International Geological Congress in 1913. According to that estimate the States having the largest original coal deposits were as follows:

Comparative tonnage of leading coal States

(By M. R. CAMPBELL)

		Short tons
1.	Wyoming	879,500,000,000
2.	North Dakota	696,700,000,000
3.	Colorado	658,300,000,000
4.	Montana	370,400,000,000
5.	Utah	188,200,000,000
6.	Illinois	182,800,000,000
7.	New Mexico	173,300,000,000
8.	West Virginia	138,400,000,000
9.	Pennsylvania	133,300,000,000
10.	Kentucky	123,000,000,000
11.	Ohio	93,800,000,000
12.	Washington	86,900,000,000
13.	Missouri	83,800,000,000
14.	Alabama	66,300,000,000
15.	Oklahoma	54,800,000,000
16.	Indiana	52,900,000,000

It is true that except for the coal of West Virginia and Ohio the coal of these other States is of less value than the coal of western Pennsylvania. If the comparison is made on a heating value basis Pennsylvania is still far down the line in respective values of coal. It is therefore clear that Pennsylvania's coal resources are not to be gauged by the large production. It is only another example of the great initiative of the men in the mining industry of Pennsylvania.

Coal Resources. The following tables present in condensed form a summary by counties of the estimated quantity of coal in the ground when mining began in Pennsylvania, the quantity mined out, and the estimated quantity still recoverable. The tables are based on estimates made by John F. Reese, engineer and geologist for the Survey in 1922, and James D. Sisler. These estimates are presented in full in Part III of this report. They were first issued in summary preliminary form as a series of mimeographed bulletins in 1922 and 1923. The first of the tables was given in a paper by Mr. Sisler on Bituminous Coal Losses (Pennsylvania Geological Survey Bulletin M4). The following quotations from Mr. Reese's preliminary bulletin explain the method of making these estimates: "For each county on which a detailed estimate has been prepared, a base map was made for each local bed by tracing its outcrop from the latest maps available. All available measurements of a coal bed were plotted on the map of that coal bed at the locality represented. By studying the distribution of the figures, areas of equal thickness were plotted, and by means of a plainimeter, the area of each coal bed in each township was measured. The unit used for calculating the quantity of coal was 90,000 short tons per inch of bed per square mile of area.

"Having calculated the quantity of coal originally contained within the area of any bed and subtracted the area already mined out, the writer determined from engineering experience the probable percentage of each bed which could be recoverd in different localities. The quantity of coal computed to be in any bed, multiplied by the assumed per cent of recovery, less 15 per cent for loss in mining, gives the estimated recoverable tonnage."

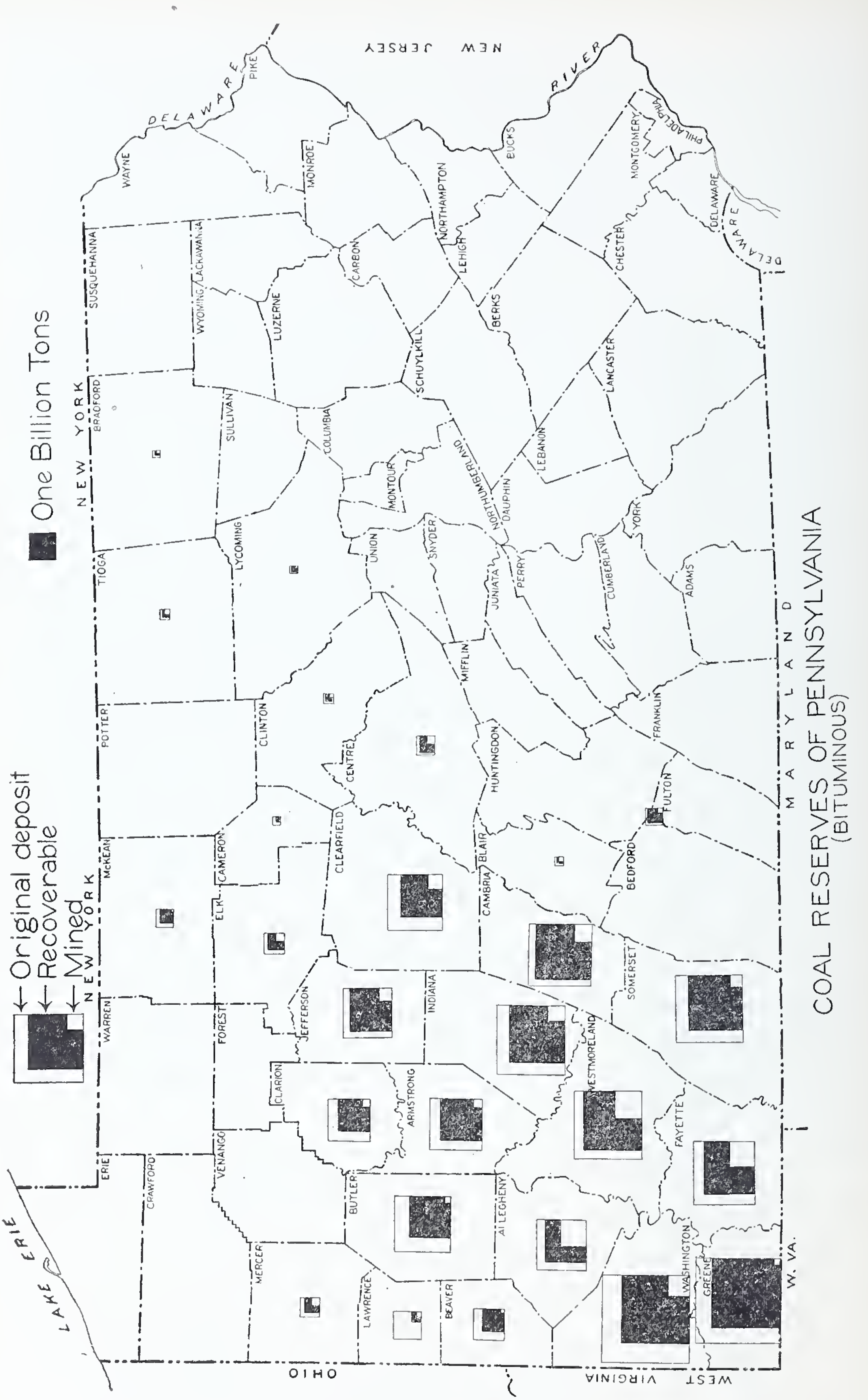


Fig. 23. Tonnage of coal in Pennsylvania by counties.

Bituminous coal resources in Pennsylvania by counties.

[Short tons]

County	Original deposit	Mined out and lost	Recoverable
Allegheny	3,194,820,000	969,200,000	1,498,948,000
Armstrong	3,750,700,000	107,290,000	2,491,100,000
Beaver	1,261,797,000	7,650,000	651,517,000
Blair	78,516,000	23,900,000	36,508,000
Bradford	44,440,000	14,500,000	15,514,000
Broad Top Field	414,954,000	41,850,000	252,918,000
Butler	4,154,807,000	39,300,000	2,257,511,000
Cambria	5,383,000,000	466,900,000	3,638,080,000
Cameron	61,560,000	235,000	33,561,000
Centre	514,485,000	75,250,000	275,076,000
Clarion	2,042,800,000	60,000,000	1,262,300,000
Clearfield	3,992,000,000	308,210,000	2,165,400,000
Clinton	114,380,000	17,221,000	54,580,000
Elk	539,781,000	54,775,000	305,231,000
Fayette	5,229,734,000	899,544,000	2,604,400,000
Greene	10,330,095,000	42,490,000	7,011,400,000
Indiana	6,339,400,000	299,200,000	4,288,700,000
Jefferson	3,334,900,000	279,400,000	2,123,400,000
Lawrence	1,007,866,000	16,445,000	484,020,000
Lycoming	72,000,000	7,000,000	40,000,000
Mercer	499,680,000	80,000,000	224,540,000
McKean	422,865,000	1,615,000	226,303,000
Somerset	6,091,800,000	187,384,000	3,986,900,000
Tioga	155,432,000	48,000,000	55,660,000
Washington	10,526,023,000	557,763,000	5,481,680,000
Westmoreland	6,381,504,000	1,218,141,000	3,297,500,000
Total	75,959,339,000	5,823,263,000	44,762,747,000

Summary of recoverable bituminous coal in Pennsylvania

County	Washington	Waynesburg	Sewickley	Redstone	Pittsburgh	U. Freeport or E	L. Freeport or D	U. Kittanning or C
Allegheny				86,625,000	284,723,000	1,127,600,000		
Armstrong					2,800,000	943,000,000	387,100,000	69,900,000
Beaver					3,087,000	171,511,000	53,515,000	
Blair						2,256,000	972,000	1,080,000
Bradford								
Broad Top						38,175,000		
Butler						260,867,000	157,888,000	342,817,000
Cambria						711,920,000	900,730,000	612,430,000
Cameron								
Centre						1,180,000	4,368,000	53,320,000
Clarion						29,200,000	27,700,000	17,800,000
Clearfield						234,500,000	537,500,000	224,200,000
Clinton								
Elk						2,083,000	5,005,000	
Fayette		199,800,000	123,600,000	75,700,000	919,300,000	1,029,000,000		59,000,000
Greene		1,647,859,000	1,119,454,000		2,831,454,000	677,484,000		
Indiana					21,200,000	1,652,800,000	1,374,800,000	
Jefferson						217,600,000	321,400,000	172,600,000
Lawrence						7,179,000	8,395,000	
Lycoming						5,000,000		
Mercer								
McKean								
Somerset			3,400,000		21,500,000[1]	525,700,000	219,600,000	2,188,500,000
Tioga								16,978,000[2]
Washington	212,540,000	668,380,000		88,000,000	3,516,860,000	995,900,000		
Westmoreland		7,600,000		163,200,000	3,538,300,000	1,859,200,000		
Total	212,540,000	2,523,639,000	1,246,454,000	413,525,000	8,139,224,000	10,492,155,000	3,998,973,000	3,758,625,000

[1]Includes Pittsburgh rider, 5,400,000 tons. [2]Seymour.

Summary of recoverable bituminous coal in Pennsylvania—Continued

County	M. Kittanning or C	L. Kittanning or B	Clarion or A′	Brookville or A	Mercer	Sharon	Total
Allegheny							1,498,948,000
Armstrong		1,001,000,000		87,300,000			2,491,100,000
Beaver	123,213,000	267,791,000		32,400,000			651,517,000
Blair		5,600,000		26,600,000			36,508,000
Bradford		3,264,000		12,250,000			15,514,000
Broad Top		80,749,000	133,994,000				252,918,000
Butler	258,593,000	233,562,000	109,059,000	902,725,000			2,257,511,000
Cambria		1,348,100,000	21,300,000	43,600,000			3,638,080,000
Cameron		3,858,000	13,533,000		16,170,000		33,561,000
Centre	24,193,000	77,296,000		114,719,000			275,076,000
Clarion	31,200,000	276,600,000	642,200,000	215,900,000	21,700,000		1,262,300,000
Clearfield	106,800,000	855,300,000		207,100,000			2,165,400,000
Clinton	3,190,000	16,961,000		19,085,000	15,344,000		54,580,000
Elk		24,464,000	117,858,000		151,063,000		300,473,000
Fayette		198,000,000					2,604,400,000
Greene							6,276,251,000
Indiana		1,239,900,000					4,288,700,000
Jefferson	268,000,000	443,100,000		700,700,000			2,123,400,000
Lawrence	119,531,000	149,975,000		154,242,000	44,698,000		484,020,000
Lycoming	15,000,000	20,000,000					40,000,000
Mercer	2,160,000	6,480,000		93,000,000	99,700,000	23,200,000	224,540,000
McKean			104,443,000[3]		121,860,000[5]		226,303,000
Somerset		910,700,000	54,600,000	62,900,000			3,986,900,000
Tioga	15,208,000[1]	6,804,000[2]		16,670,000[4]			55,660,000
Washington							5,481,680,000
Westmoreland	297,500,000	431,700,000					3,297,500,000
Total	1,256,588,000	7,601,204,000	1,196,987,000	2,689,191,000	470,535,000	23,200,000	44,022,840,000

[1] Morgan [2] Bloss [3] Clermont [4] Bear Creek [5] Alton

This figure of 75 billion tons is much smaller than that arrived at by Mr. Campbell of the U. S. Geological Survey. There are two reasons for this. First, the Reese-Sisler estimates are based on "available reserves" and are calculated on coal from 18 inches and up, while Mr. Campbell included coal down to 14 inches. In the second place, it is believed to have been based on much fuller information, taking advantage of information of a negative nature derived from drillings and from a wide personal knowledge by Mr. Reese from field studies for the State Tax Board, and by Mr. Sisler from his study of mining losses and his studies for Part II of this volume. Mr. Campbell estimated the bituminous coal field of western Pennsylvania to have an extent of 14,200 square miles and to contain, when mining began, 112,574,000,000 short tons. He figured that the supply remaining at the close of 1907 was 109,804,000,000 tons, or 492 times the exhaustion represented by the production of that year.

Outlook and rate of exhaustion. "How long will 44 billion tons of recoverable coal last?" In answering that question several factors must be taken into account. The simplest answer is obtained by dividing the total quantity of recoverable coal by the latest available figures for a year's recovery. The production of bituminous coal in Pennsylvania in 1925 is estimated at 139,862,000 short tons. At that rate the bituminous coal of Pennsylvania would last over 300 years. A more conservative answer would be arrived at if the figure for reserves were divided by the average bituminous production for the last 10 years. The average for the years 1916 to 1925 inclusive is 151,419,000 tons. For five of those years the production was over 170 million tons annually. Strikes and other (to be hoped) temporary conditions cut down the production for several of those years. The normal production of the bituminous coal field of Pennsylvania might therefore be conservatively estimated at 170 million tons a year. If that average production was maintained to the end, the bituminous coal field of Pennsylvania would last about 260 years.

But there are many possible conditions that may completely change the present outlook. Large scale experiments are being carried on for the low temperature distillation of bituminous coal that give promise of success. The end product of this process is a smokeless fuel that will compete with anthracite, and because of its probable lower cost may ultimately drive anthracite from the market. As the recovery of smokeless fuel or "artificial anthracite" is hardly more than 70 per cent of the coal used, it would require 128 million tons of bituminous coal to replace 85 million tons of anthracite now used yearly. If only 80 million tons of this by-product fuel came from Pennsylvania, that much must be added to the quantity of Pennsylvania bituminous coal exhausted each year, making a total average yearly production of bituminous coal from Pennsylvania 250 million

tons. If such a yearly production were maintained the bituminous coal of Pennsylvania would be completely exhausted in less than 200 years, as the process of replacement will undoubtedly be a matter of slow growth.

On the other hand, the efficient use of coal is improving at a rate that threatens to more than offset any such possible drain that would come if bituminous coal replaced anthracite. The more efficient use of coal has made enormous strides in the last few years and promises to make even greater strides. A few years ago the most efficient engine utilized not more than 15 per cent of the energy of the coal and wasted over 85 per cent, while the average engine utilized only between 5 and 10 per cent of the coal's energy and wasted between 90 and 95 per cent. Today giant power stations of high efficiency are replacing many small inefficient power plants, and these more efficient large power stations are steadily increasing their own efficiency. The effect of the saving through this increased efficiency has been expressed in this way. The amount of electricity produced in the United States in 1925 was 11.5 per cent more than in the previous year. Yet the quantity of coal consumed in this production was only 7 per cent greater than in the preceding year, a gain in efficiency in one year that resulted in a saving of 1/10 of a pound of coal per kw. hour, or a saving of 2 million tons of coal during 1925. Taking a longer period, in 1919 an average of 3.2 pounds of coal were required to produce a kw. hour in public service stations. In 1925 that average was reduced to 2.1 pounds of coal per kw. hour. If the use of coal continues to gain in efficiency in the years to come as it has in the past few years, it is not difficult to picture the production necessary to meet our needs as declining rather than increasing. Up until 20 years ago our demand and production of coal doubled practically every 10 years. Had our production continued to increase at that rate, our coal fields would have been exhausted in a relatively short time. During the last 20 years the production curve has flattened out, reaching a peak in 1918 which has not been surpassed since and which possibly may continue to be the maximum for many years. Experiments are in progress in many lines that ultimately may double our present recovery of the energy in a pound of coal. If these experiments succeed to this extent, the life of our coal fields would be doubled. As our demand for power is constantly increasing, the increased efficiency is partly offset by the ever-increasing use made possible by cheaper cost.

It is probable that the steadily increasing use of water power has had some effect in reducing the demand on coal in recent years. The effect of utilization of water power is small when it is realized that out of 17,380,000,000 kwh. used in Pennsylvania in 1922, only 320,000,000 or less than 2 per cent came from sources other than coal (report of Pennsylvania Giant Power Board).

There is, however, one source of demand for coal which does not exist now, but will exist in the future. The largest single use of power in Pennsylvania today is for running automobiles. In 1923 Pennsylvania had, according to the Bureau of Census, 5,107,593 horse power in engines used in manufacture, about 2 million horse power used in mining, 1,500,000 horse power in use by the public power companies; 167,000 horse power used by the street railway industry of Pennsylvania. In 1926 over 1-1/3 million passenger automobiles in addition to trucks and busses were registered in Pennsylvania. If each of these were only 10 horse power, the horse power of the automobiles in Pennsylvania far exceeds the installed horse power of all other engines. In addition much oil or gasoline is being used in pumping oil wells, in construction and road work of all kinds, and in oil burning domestic furnaces. There may be differences of opinion as to whether our present methods of obtaining oil will continue to serve us for 10 years or 25 years. Secondary recovery methods will recover much of the oil being left in the ground by present methods which may extend the life of the oil industry to possibly 100 years by deriving oil from oil sands. In the meantime, as the supply from oil sands slowly declines, oil from oil shales will take its place. Our oil and shales may serve the world for from 100 to 200 years, hardly more, but at a cost that will steadily tend to shift the load back to coal. Ultimately coal will have to shoulder the whole load of providing oil or gasoline for all moving vehicles, and power for all purposes except for what may be carried by water, wind or waves, forms of power which at present do not appear to be a large part of the whole.

Just how these various conditions will affect the future life of the Pennsylvania bituminous coal field is rather difficult to forsee at present. But in any case it would seem that 250 years will mark the end of large production from the coal fields of Pennsylvania. One factor which may lengthen the life of the field has not been discussed and that is how the coal mining industry tends to shift from areas in which there have been thick beds of coal which could be mined cheaply, to other areas of thick coal as the thick coal of the first area is exhausted. Pennsylvania's thick coal is very limited as compared with that in some other States. Probably the total quantity of coal in Pennsylvania in beds over 5 or 6 feet thick is not over 10 billion tons. Illinois has in one bed alone an estimated reserve of 56 billion tons, all of which is thick coal. It is therefore possible to see a shift of industries and of mining from Pennsylvania to Illinois when Pennsylvania thick coal has all been taken out. This will, of course, relieve the demand on coals which are thinner and more costly to mine and will lengthen the life of the field.

PHYSICAL AND CHEMICAL CHARACTER OF PENNSYLVANIA BITUMINOUS COAL.

Part IV of this volume contains all analyses of Pennsylvania bituminous coals made by the U. S. Bureau of Mines to the date of publication. This section is a very brief review of the findings of those analyses.

Kinds of bituminous coal in Pennsylvania. Three kinds of bituminous coal occur in Pennsylvania, caking, non-caking, and cannel. Cannel coal is widely distributed over the bituminous fields of Pennsylvania but is usually of very limited extent. Several of the deposits were obviously laid down in old stream channels, the deposits being 10 feet or more thick in the center and thinning out on either side to 0 within a few hundred feet as the banks of the old channel are approached. Such channel filling may be a mile or more long and only 600 or 800 feet wide. Cannel coal deposits occur in Centre, Clearfield, Indiana, Westmoreland, Armstrong, Allegheny. Butler, and Beaver counties and probably in some of the other counties. These deposits have been described in U. S. Geological Survey bulletin 659, and in the report of this Survey on Oil Resources in Coals and Carbonaceous Shales of Pennsylvania, by Charles R. Fettke, 1923. Cannel-like shale, a close relative of cannel coal, is found also in Greene, Lawrence, Mercer, Jefferson, Tioga, and possibly other counties.

Non-caking or splint coal occurs notably at the horizon of the Sharon coal, stratigraphically the lowest coal bed of western Pennsylvania. That coal is a splinty block coal and has, because of its non-caking character, been used in the raw state in blast furnaces in the Mahoning Valley region and surrounding area. Coal at many places is reported not to make good coke, but the writer does not know whether this is due to the coal being of the splint kind or to some other cause. The bulk of the bituminous coal of Pennsylvania is of the caking variety, though it may not all make good coke.

Classes of bituminous coal in Pennsylvania. Bituminous coal of Pennsylvania is all of high class or rank, that is, it has all reached the latter or higher stages in the transition from lignite to anthracite. According to the writer's proposed classification it will all fall into four classes—high volatile coal (hivol or coal 56 to coal 63); medium volatile coal (midvol or coal 63 to coal 70); low volatile coal (lovol coal or coal 70 to coal 77). Coal at Johnstown and in the Broad Top field barely enters the next higher class called by the author loervol coal or coal 77 to coal 84. This coal fills in the wide gap between the lovol coal and anthracite, a gap that corresponds with the geographic gap between the easternmost bituminous coal fields and the westernmost anthracite fields. Coal of this class is abundant in Great Britain where it is called Admiralty coal. It is found also in Virginia and Arkansas.

The accompanying isocarb map is adopted from an isovol map prepared by Mr. Sisler. It shows very plainly the percentage increase of fixed carbon in going from west to east or vice versa, and the decline in the percentage of volatile matter in the same direction. The map also shows that the transition is not a uniform one, but that locally the process is reversed. Thus in Cambria County it will be noted that the fixed carbon along the eastern edge of the county is not as high as it is farther west around Barnesboro and Patton. The same condition exists between Welsh, West Virginia and Pocahontas, Virginia. The coal at Welsh has more fixed carbon than the coal at Pocahontas, many miles to the eastward. It has been suggested that this is because this lower fixed-carbon coal has escaped the compression suffered by the other coal by having in the folding been lifted out of the plane of maximum squeezing.

For the purpose of this map the coal has been considered on the dry, ashless basis or as pure coal. The figures would therefore be from 10 to 15 per cent smaller if given on the "as received" coal basis. This map, prepared by Mr. Sisler, is based on 1500 analyses from 606 mines and 7,500 car samples from 77 mines. The distribution of these samples by counties is shown in the following table:

Allegheny	20	Greene	21
Armstrong	40	Huntingdon	5
Beaver	6	Indiana	33
Bedford	5	Jefferson	26
Blair	2	Lawrence	3
Bradford	2	Luzerne	2
Butler	17	Lycoming	1
Cambria	92	McKean	2
Cameron	1	Mercer	5
Centre	13	Somerset	77
Clarion	22	Sullivan	4
Clearfield	59	Tioga	9
Clinton	2	Washington	31
Elk	8	Westmoreland	44
Fayette	54		
			606

This map was first published in small scale form as mimeograph bulletin No. 81. Mr. Sisler has this to say regarding it.

"The accuracy of the map is limited primarily by lack of analyses in various localities. For the many outlying districts having no authoritative analyses, reports of the Second Geological Survey and of private companies were used. These analyses of course are less accurate (standardized) than those made by the U. S. Bureau of Mines under ideal (standard) conditions. In areas where the coal

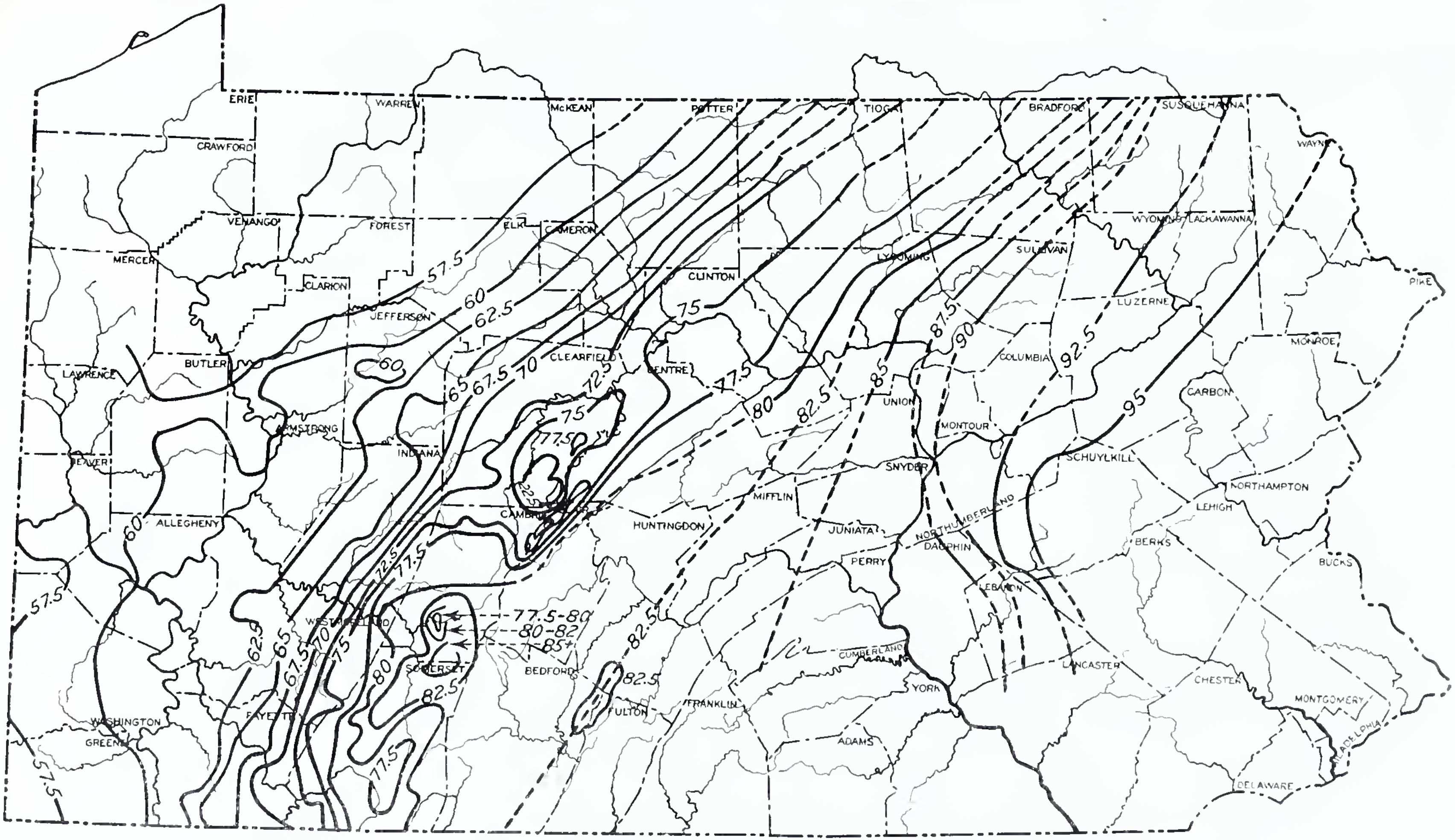


Fig. 24. Isocarb map, showing increase in percentage of fixed carbon in coal from west to east.

has been eroded isovol (isocarb on this map) lines are dotted. These dotted lines are hypothetical, being based on the extent of folding and faulting in the district."

Description of isocarb map. The following description is taken from Mr. Sisler's bulletin except that the figures have been transferred from those for volatile matter to those for fixed carbon.

Pennsylvania has very few coals having less than 57.5 per cent fixed carbon on the pure coal basis. The mineable coal in the western part of Greene County and the southern part of Washington County, and a small area in northwestern part of Washington County, southern Beaver and western Allegheny counties, has less than 57.5 per cent fixed carbon. The 57.5 isocarb line as drawn on the map nearly follows the northwestern limits of the bituminous coal fields. Small areas of lower Allegheny and Pottsville coals lie northwest of that line.

The area containing coals ranging from 60 to 62.5 per cent fixed carbon runs in a general north-south direction on Monongahela and Allegheny Rivers and up Red Bank Creek. It extends northeast in the vicinity of St. Marys and Coudersport. Several small local areas have less than 60 per cent fixed carbon. Thsee are near New Geneva and Lamberton in Fayette County; Fredericktown and Millsboro in Washington County; Herminie in Westmoreland; Freeport, Johnetta, Manorsville, and Eddyville in Armstrong; Sommerville and Knoxdale in Jefferson County. A rather extensive area on Monongahela and Youghiogheny rivers in the vicinity of Charleroi, Monongahela, Sutersville, Irwin, Elizabeth, and Versailles has, in general, fixed carbon above 62.5 per cent.

The area between 62.5 and 72.5 isocarb lines extends in a northeast-southwest direction through eastern Fayette and western Somerset counties; central Westmoreland and Indiana counties; southeastern Jefferson, northwestern Clearfield, southeastern Elk, Cameron, and the center of Potter County.

The area containing coal ranging from 72.5 to 75 fixed carbon lies in southwestern Somerset, northeastern Fayette, eastern Westmoreland and Indiana, northern Cambria, eastern Clearfield, western Clinton, southeastern Potter, and the central part of Tioga. Local exceptions are as follows: In eastern Clearfield County a large area in the vicinity of Glasgow, Madera, Woodland, Karthaus, Peale, and Houtzdale, ranges from 75 to 77.5 per cent fixed carbon. Two local areas in the vicinity of Smoke Run and Osceola Mills range from 77.5 to 80 per cent fixed carbon.

The area containing coals of 75 to 77.5 per cent fixed carbon extends across western Somerset, eastern Westmoreland, southeastern Indiana, northern Cambria, northwestern Blair, western Centre, central Clinton, northwestern Lycoming, and southeastern Tioga counties. This area is very irregular, wide in western Somerset, thinning

in the vicinity of Boswell, to widen again in the vicinity of Wilpen, Westmoreland County. From Spangler, Cambria County, eastward to the Allegheny Front the area is much contracted especially on the western slope of the mountain. It widens again in Clinton, Lycoming, Tioga, and Bradford counties.

Coals containing 77.5 to 80 per cent fixed carbon lie in central and northwestern Somerset, northeastern Westmoreland, southeastern Indiana, central Cambria, northwestern Blair, western Centre, southeastern Clinton, central Lycoming, and southeastern Tioga County. Coals having 80 to 82.5 per cent fixed carbon occur in eastern and northeastern Somerset, southern Cambria, northeastern Bedford, and southern Huntingdon counties. A local exception is as follows: In the vicinity of Stoyestown, Hooversville, Holsopple, Ashtola, Somerset County, and Dunloa, South Fork, Franklin, and Dale, Cambria County, the coals range from 82.5 to 85 per cent fixed carbon. In the vicinity of Windber, on the Somerset-Cambria county line, the coals have 85 per cent or more fixed carbon. East of Johnstown in a local area the fixed carbon ranges from 77.5 to 82.5 per cent.

The limits of the area containing coals ranging from 82.5 to 87.5 per cent fixed carbon were drawn on very little data because practically all the coals have been eroded. This area extends through southeastern Lycoming and western Sullivan counties. The area containing 87.5 to 92.5 per cent fixed carbon includes the Lykens and Bernice districts of the anthracite field. This area extends northeast-southwest through eastern Sullivan, Northumberland, eastern Dauphin, northwestern Lebanon, and the western tip of Schuylkill County. The area containing coals ranging from 92.5 to 95 per cent fixed carbon includes the outlying areas of the anthracite district. It extends through northern Lackawanna, central Luzerne, southern Columbia, eastern Northumberland, and the western part of Schuylkill County. The area containing coals having approximately 95 per cent volatile matter includes northern Schuylkill, southern Columbia, southern Luzerne and northern Carbon counties.

Analyses of Pennsylvania Coals.

Part IV of this volume contains detailed analyses of Pennsylvania coals. Selected average analyses standardized to 3 per cent moisture and 6 per cent ash are given in the following table. The coal in each of the districts varies much from the analyses given, not only in percentage of ash but in the ratio of fixed carbon to volatile matter. The analyses are, however, fairly characteristic of the coal fields within the State.

A few average analyses of coals from nearby States are also given for comparison. As far as possible these analyses are based on analyses of samples of delivered coal as reported in bulletins 119 and 230 of the U. S. Bureau of Mines.

Analyses of bituminous coals of Pennsylvania and other States.

Field	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	B. t. u.
Pennsylvania						
Broad Top	2.0	16.0	76.0	6.0	1.25	14,250
Blossburg	3.0	21.0	71.0	6.0	1.0	14,250
Moshannon	3.0	22.0	69.0	6.0	1.0	14,250
Barnesboro-Patton	3.0	23.0	68.0	6.0	1.5	14,200
South Fork-Johnstown	3.0	17.0	74.0	6.0	1.0	14,250
Windber-Jennerstown	3.0	17.0	74.0	6.0	1.0	14,250
Somerset-Southern	3.0	22.0	69.0	6.0	1.5	14,000
Clearfield Co., N. W.	3.0	26.0	65.0	6.0	1.5	14,000
Dubois-Punxsutawney	3.0	30.0	61.0	6.0	1.0	14,000
Indiana	3.0	25.0	66.0	6.0	1.5	14,000
Ligonier	3.0	25.0	66.0	6.0	2.0	14,000
Latrobe	3.0	28.0	63.0	6.0	1.5	14,000
Connellsville	3.0	30.0	61.0	6.0	1.0	14,000
Uniontown	3.0	31.0	60.0	6.0	1.0	14,000
Greensburg	3.0	32.0	59.0	6.0	1.0	14,000
Irwin basin	3.0	34.0	58.0	6.0	1.5	14,000
Western Fayette County	3.0	35.0	56.0	6.0	1.0	13,800
Northeast Greene County	3.0	35.0	56.0	6.0	1.5	13,800
S. E. Washington Co.	3.0	34.0	57.0	6.0	1.0	14,000
S. Allegheny County	3.0	36.0	55.0	6.0	1.5	13,750
N. Allegheny County	3.0	36.0	55.0	6.0	1.5	13,750
Armstrong County	3.5	34.0	56.5	6.0	1.5	13,750
N. W. Washington County	3.0	39.0	52.0	6.0	1.0	13,500
Beaver County	4.5	38.0	51.5	6.0	2.0	13,500
Butler County	3.5	38.0	52.5	6.0	2.5	13,500
Clarion County	4.0	38.0	52.0	6.0	3.5	13,500
Lawrence County	6.0	36.0	52.0	6.0	2.5	13,000
Mercer County	5.0	35.0	54.0	6.0	1.0	13,000
Other States						
Georges Creek, Maryland	3.0	19.0	72.0	6.0	1.0	14,200
Pocahontas, Virginia	3.0	20.0	71.0	6.0	.7	14,500
Pocahontas field, W. Va.	3.0	18.0	73.0	6.0	.7	14,250
New River, W. Va.	3.0	21.0	70.0	6.0	1.0	14,250
Kanawha, West Virginia	3.0	35.0	56.0	6.0	1.5	14,000
Fairmont, West Virginia	3.0	38.0	53.0	6.0	1.5	13,750
Belmont, Ohio	4.0	37.0	53.0	6.0	3.5	12,800
Hocking, Ohio	6.0	34.0	55.0	6.0	1.5	12,800
Harlan & Bell Cos., Ky.	3.0	38.0	53.0	6.0	1.0	13,800
Western Kentucky	4.0	36.0	50.0	10.0	3.0	12,750
Indiana	10.0	36.0	44.0	10.0	3.0	11,500
Southern Illinois	7.0	35.0	48.0	10.0	2.5	12,250
Northern Illinois	13.0	35.0	38.0	12.0	4.0	11,000

Cause of differing classes of coal in Pennsylvania. Questions are often asked as to the origin of the classes of coal in Pennsylvania: referring to differences in the percentage of fixed carbon and volatile matter in the anthracite at the east, and the high-volatile coals of western Pennsylvania. It is believed that all of the coal of Pennsylvania is of the same general age. Some of the beds can be traced with much certainty from the Ohio State line to Clearfield and Centre counties, and with less certainty to Lycoming and Bradford counties. With still less certainty attempts have been made to correlate the beds of the anthracite fields with those in the bituminous field. For example, the Mammoth bed has been thought to occupy the same stratigraphic position as the Lower Kittanning bed of the bituminous field, and the Buck Mountain bed with the horizon of the Brookville bed. It is highly probable, if not certain, that when the coals were originally laid down all of them were of the same general character from one end of the State to the other. The

differences found today are believed to be due to the folding and pressure to which the beds were subjected, at the end of the Carboniferous age, after they were laid down.

The cause of this folding is not known though several theories are under discussion. The apparent result of the folding was to squeeze together and shorten a long segment of the earth's crust coincident with the present Appalacian Mountain province. Apparently movement was from the southeast to the northwest. The effect of the squeezing is more pronounced at the southeast and steadily diminishes northwest. The rocks in the southeast part of the State were folded, crushed and metamorphosed. Mud rocks were squeezed along the bedding until new planes of splitting were produced at right angles to the direction of pressure, producing slate, which occurs in the slate region of eastern Pennsylvania. Still farther southeast the rocks, which originally contained clay or mud were so highly heated by the pressure and movement that the "water of composition" of the clay or mud was driven off and the material was converted into feldspar and other minerals of that kind, and the rock was changed into a schist or gneiss. In places the pebbles of conglomerate were squeezed into flat discs.

Farther west in the broad belt between North or Kittatinny Mountain and Allegheny Mountain the squeezing was not so severe, yet severe enough to fold the rocks into close and overturned folds, to fracture the coal beds, and to convert them in eastern Pennsylvania into anthracite. In places the coal in the beds was squeezed out of its original position and flowed like sand or tar from points of high pressure to points of somewhat lower pressure. The effect of this is discussed a little beyond. West and north of Allegheny Mountain the squeezing forces seem to have partly spent themselves and the folding is comparatively mild and becomes successively milder going westward to the State line. It is believed that this folding involved a certain amount of slipping and adjustment of the beds on each other. As the folds develop with slipping, and adjustment within the softer beds, such as the coal beds and clay beds, such slipping and adjustment is certain to have produced some heat, more or less proportional to the degree of folding. This heat would naturally have some effect upon the coal and other rocks as similar heating today would have. If we place coal in a retort and heat it to higher and higher temperatures results are constantly changing. A little heat simply drys the coal and drives out the moisture. A higher temperature drives off a small quantity of gas and a larger quantity of light tar or oil. If the process is stopped at this point the coal is found to have changed a little; it contains less volatile matter due to the driving off of the gas and oil. If another lot of coal is more highly heated, more gas is driven off and less oil or tar. If the temperature is raised to that

used in making artificial gas, much gas is driven off and only a little dense tar, and the material left is coke which contains less than 1 per cent volatile matter. The carbon residues of these successive stages of heating resemble chemically the successive ranks and classes of coal from lignite to anthracite.

These differences due to the use of different temperatures are well shown in the following table from a study of Pennsylvania coals by Porter and Ovitz, of the U. S. Bureau of Mines.

*Gases evolved from Pennsylvania coal (Porter & Ovitz)**

Furnace temp. °C.	500	600	700	800	900	1000	1100
Coal temperature °C.	390	474	589	705	812	922	1010
Volume of gas c.c. at 25° C.	161	718	1220	1723	2080	2900	3530
Analysis (N. free)							
CO_2	15.9	4.2	3.2	2.0	1.1	1.2	1.0
Illuminants	9.1	7.1	4.3	4.5	4.8	4.6	5.2
CO	7.8	6.0	6.3	7.2	7.4	6.4	7.3
CH_4, C_2H_2, etc.	63.3	64.4	55.8	47.0	33.2	29.0	26.3
H_2	3.9	18.3	30.4	39.3	53.5	58.8	60.2

*U. S. Bureau of Mines, Bull. 1, p. 30 (Connellsville coal).

Notice especially the change in the volume of gas given off at the several temperatures. The coal which has been heated only to 500° C. has lost little of its gas and is still a high volatile coal. If it is assumed the coal originally had 40 per cent volatile matter and after it had given up 3600 cubic centimeters it had none left, and if the ash and moisture was disregarded, it could be estimated that the coal lost 1 per cent volatile matter for each 60 c. c. of gas given off. A table could then be constructed to show the effect of such distillation of coal:

Table showing equivalents in classes of coal produced in distillation of coal at high temperatures.

	Per cent loss of gas	Per cent remaining gas	Equivalent coal		Classification of coal
			Volatile matter	Fixed carbon	
Normal	0	40	40	60	Hivol
500°	1.7	38.3	38.5	61.5	Hivol
600°	8.	32	35	65	Hivol
700°	13.5	26.5	30	70	Midvol
800°	19.1	20.9	25	75	Lovol
900°	23.1	16.9	22	78	Loervol
1000°	32.2	7.2	10	90	Anthracite
1100°	39.5	.5	1	99	Natural coke

The percentages of volatile matter and fixed carbon are of the ashless, moisture-free coal. It is not to be thought that the different classes of coal in Pennsylvania have actually been subjected to these temperatures, as the actual coals were subject to three factors which

are not involved in the high temperature tests just mentioned. 1. Time, believed to have been millions of years. 2. Pressure, from the overlying weight and the pressure that produced the folding of the rocks. 3. Movement, that is believed to have produced the jointing of the coal and later the almost complete fracturing of the higher fixed carbon coals and finally the recompacting of anthracite. (This fracturing is thought by some to facilitate the loss of volatile matter). It is not doubted that the folding of the coal beds would raise the temperature, but it is believed that in the presence of the other factors given it was not necessary to raise the temperature to so high a point to accomplish the results obtained. These tests, however, give a good idea of the character of the influences that have produced the various classes of coal found in Pennsylvania.

Moisture in bituminous coals of Pennsylvania. Pennsylvania bituminous coal averages about 3 per cent moisture. The cannel coals contain little moisture. Those of Pennsylvania are no exception and may have as low as .6 per cent moisture on the as received basis. A few of the analyses of bituminous coal show over 5 per cent moisture. In some instances it is obvious that the high moisture content is due to special causes, such as partial weathering of the coal. Certain samples were taken in the entries of small mines close to the mine mouth. It is highly probable that such coal has been slightly oxidized, the change showing in part in the increased moisture content. In other instances it may be that the coal has come from a part of the mine under shallow cover and subject to infiltration of water. The number of samples having more than 4 per cent moisture is very small and the bulk of the analyses have between 2 and 3.5 per cent moisture. While this is true of the bituminous coal fields of Pennsylvania as a whole, the coal of the northwestern counties shows a slight increase in moisture content. In Mercer and Lawrence counties, for example, the moisture content of the coal averages about 5 per cent. In Beaver and Butler counties the moisture content is about 4 per cent. The average is a little higher in Beaver than in Butler. The coal of the Broad Top field in Huntingdon and Bedford counties is lower in moisture than the average for all coals in the State. In Bedford county all but one of the analyses show less than 2 per cent moisture.

Ash in the bituminous coal of Pennsylvania. It is not possible to generalize on the percentage of ash in the bituminous coals of Pennsylvania as has been done with the percentage of fixed carbon and of moisture. The following table gives the percentages of ash in various beds in numerous coal-producing counties. The numbers represent number of the mines and not number of samples. These determinations are mainly from coal mine section samples and not car samples. They are a little better than the car samples taken from the same mine in the same region. The total number of samples for any bed or

for any county is not large enough to serve as definite criteria. Only a few groups of analyses are available for many of the beds. In general the beds above the Pittsburgh are higher in ash than the Pittsburgh. The coal beds of the Conemaugh group also have more ash in them than either the Pittsburgh bed or the principal beds of the Allegheny Group. The figures are presented for what they are worth.

Table showing ash content of Pennsylvania bituminous coal, by mines

(U. S. Bureau of Mines)

Coal bed	Under 6%	6–8%	8–10%	10–12%	12–14%	Over 14%	Totals
ALLEGHENY COUNTY							
Sewickley				1			1
Redstone			1	1			2
Pittsburgh	2	7		1	1		11
Bakerstown						1	1
per Freeport	1	8	1	2			12
	3	15	2	5	1	1	27
ARMSTRONG COUNTY							
Pittsburgh			1				1
Upper Freeport	1	12	5	3			21
Lower Freeport		1	1	1		1	4
Upper Kittanning						1	1
Lower Kittanning	1	3	6	2			12
	2	16	13	6		2	39
BEAVER COUNTY							
Upper Freeport	1	1					2
Upper Kittanning		1					1
Middle Kittanning	1						1
Lower Mercer		1				1	2
	2	3				1	6
BEDFORD COUNTY							
Upper Freeport				1	1		2
Lower Kittanning	1	1					2
	1	1		1	1		4
BLAIR COUNTY							
Upper Freeport		1					1
Lower Kittanning	1						1
Brookville				1			1
	1	1		1			3
BRADFORD COUNTY							
Clarion				1			1
				1			1
BUTLER COUNTY							
Upper Freeport		4	4	3			11
Upper Kittanning	1	1					2
Middle Kittanning				2	1		3
Brookville				1	1		2
	1	5	4	6	2		18

Coal bed	Under 6%	6-8%	8-10%	10-12%	12-14%	Over 14%	Totals
CAMBRIA COUNTY							
Upper Freeport		6	5	2			13
Lower Freeport		10	5	1			16
Upper Kittanning		3	6	4			13
Middle Kittanning			1				1
Lower Kittanning	13	39	3				55
Brookville					1		1
	13	58	20	7	1		99
CAMERON COUNTY							
Lower Kittanning		1					1
		1					1
CENTRE COUNTY							
Lower Freeport			1				1
Lower Kittanning		6	2	1	2		11
Brookville				1		1	2
		6	3	2	2	1	14
CLARION COUNTY							
Upper Freeport		2					2
Lower Freeport		1					1
Upper Kittanning			2			1	3
Lower Kittanning	1	4	5				10
Clarion		2	1	1			4
Brookville			1	2			3
	1	9	9	3		1	23
CLEARFIELD COUNTY							
Upper Freeport		3	4	1			8
Lower Freeport	3	11	4				18
Upper Kittanning		1	1				2
Middle Kittanning		1	1	3	1		6
Lower Kittanning		6	10	2	1		19
Brookville		1	1	1	1		4
	3	23	21	7	3		57
CLINTON COUNTY							
Lower Kittanning		1					1
Brookville						1	1
		1				1	2
ELK COUNTY							
Middle Kittanning						1	1
Lower Kittanning	1	2	3				6
Brookville	1						1
	2	2	3			1	8
FAYETTE COUNTY							
Waynesburg				1	1	2	4
Sewickley			3	9			12
Redstone		1					1
Pittsburgh		9	5	1			15
"Hager"			1				1
Gallitzin			1				1
Upper Freeport	1	2			1	2	6
Lower Freeport		1		1	1		3
Upper Kittanning		1	2			1	4
Lower Kittanning		2	1	1		1	5
Clarion					1		1
Brookville				1			1
	1	16	13	14	5	6	55

Coal bed	Under 6%	6–8%	8–10%	10–12%	12–14%	Over 14%	Totals
GREENE COUNTY							
Washington					1		1
Waynesburg					3	4	7
Sewickley			2	1			3
Pittsburgh	1	7	2				10
	1	7	4	1	4	4	21
HUNTINGDON COUNTY							
Lower Kittanning		2	1				3
Clarion			1				1
		2	2				4
INDIANA COUNTY							
Pittsburgh				2			2
Upper Freeport	1	3	10	2			16
Lower Freeport	1	1			1		3
Upper Kittanning	1		1				2
Middle Kittanning			1				1
Lower Kittanning		5	4				9
	3	9	16	4	1		33
JEFFERSON COUNTY							
Upper Freeport		2	4				6
Lower Freeport	5	3	1	3			12
Upper Kittanning			1				1
Middle Kittanning				1			1
Lower Kittanning		2		2			4
Brookville			2	1	1		4
	5	7	8	7	1		28
LAWRENCE COUNTY							
Middle Kittanning			1				1
Brookville	1						1
	1		1				2
LYCOMING COUNTY							
Lower Kittanning						1	1
						1	1
McKEAN COUNTY							
"Lower vein bed"	1						1
"Upper vein bed"		1					1
	1	1					2
MERCER COUNTY							
Brookville	2	2	1				5
	2	2	1				5
SOMERSET COUNTY							
Sewickley			1				1
Redstone				4			4
Pittsburgh	2	4	3	2	1	1	13
Barton		1					1
Bakerstown		1					1
Upper Freeport		1	2	4	2	1	10
Lower Freeport	1		4	1			6
Upper Kittanning		7	6	4	3		20
Lower Kittanning	3	7	8	2	2		22
Brookville			1	1			2
	6	21	25	18	8	2	80

Coal bed	Under 6%	6–8%	8-10%	10–12%	12–14%	Over 14%	Totals
WASHINGTON COUNTY							
Washington					1		1
Waynesburg						3	3
Sewickley					1		1
Redstone			1				1
Pittsburgh	7	8	4	3	1		23
Harlem		1					1
	7	9	5	3	3	3	30
WESTMORELAND COUNTY							
Waynesburg						2	2
Sewickley		1			1		2
Redstone			3	1		1	5
Pittsburgh	1	2	2		1		6
Bakerstown						3	3
Mahoning			2	1		1	4
Upper Freeport		3	6	3	2		14
Lower Freeport			1				1
Lower Kittanning		1	3				4
	1	7	17	5	4	7	41
Grand total							604

The results of analyses of car samples taken by the U. S. Bureau of Mines from coal delivered on Government contracts are summarized in the following table. The figures represent mines, not samples. The samples and analyses are several thousand in number. These samples are not representative of the entire coal field because the largest shipments and consequently the largest number of anaylses from single mines have come in the main from mines producing low-ash coal.

Ash in Pennsylvania bituminous coal (car shipments).

Number of mines in each class.

Counties	Under 6%	6–8%	8–10%	10–12%	12–14%	Over 14%	Totals
Allegheny	1	2	1	2	3		9
Armstrong				2			2
Bedford				1	2		3
Blair			1				1
Cambria		52	44	15	9		120
Centre				1		3	4
Clearfield	1		10	7	1	1	20
Elk & Jefferson			1				1
Fayette			1	7	1	2	11
Huntingdon			1	1			2
Indiana			5	1	2	1	9
Jefferson		2	3	1			6
Somerset		7	27	27	19	16	96
Washington		4	3	5			12
Westmoreland	1	6	10	11	1		29
	3	73	107	81	38	23	325

The B. t. u. (heating) value of Pennsylvania bituminous coal. A study of the B. t. u. determinations in Part IV of this volume shows a close relation between the percentage of fixed carbon and the B. t. u. of the coal. The higher the fixed carbon the higher the B. t. u. There is a difference of 1,000 B. t. u's. between the coal of Mercer County and that of the Broad Top field in Huntingdon County as determined on the dry, ash-free basis. A measurement is made on that basis to eliminate the variable effect of both ash and moisture. The difference in heat value between the coals at the west and the coals southeast is due to the decrease in the percentage of oxygen in the high-carbon coals as compared with the low-carbon coals. Thus the coals of Mercer County on the dry, ashless basis contain about 42 per cent volatile matter and 58 per cent fixed carbon, in contrast with the coal of Cambria County which on the same basis contains about 23 per cent volatile matter and 77 per cent fixed carbon. The coal of Mercer County after eliminating the sulphur and nitrogen is composed of about 5.9 per cent hydrogen, 83.3 per cent carbon, and 10.9 per cent oxygen. Under the same conditions the coal from Cambria County is composed of about 4.7 per cent hydrogen, 88.8 per cent carbon, 6.5 per cent oxygen. There is a difference of 4.4 per cent of oxygen between the two coals. We do not know just how the oxygen is combined with the hydrogen and carbon in the coal. Actual tests, however, show that 1 per cent of volatile matter in coals of the class to which the Mercer County coal belongs will yield about 150 B. t. u. while 1 per cent of volatile matter of the class of coal found in Cambria County will yield 200 to 210 B. t. u., a difference of 50 to 60 B. t. u. for each 1 per cent of volatile matter. In the Mercer County coals the fixed carbon and volatile matter yield about the same amount of heat for each 1 per cent of volatile matter. In the Cambria County coals a difference of 50 B. t. u. for each 1 per cent of volatile matter is quite sufficient to account for the difference of 1,000 B. t. u's higher value in the Cambria County coal.

The distribution of B. t. u. values of the bituminous coals of Pennsylvania is shown on the following sketch map.

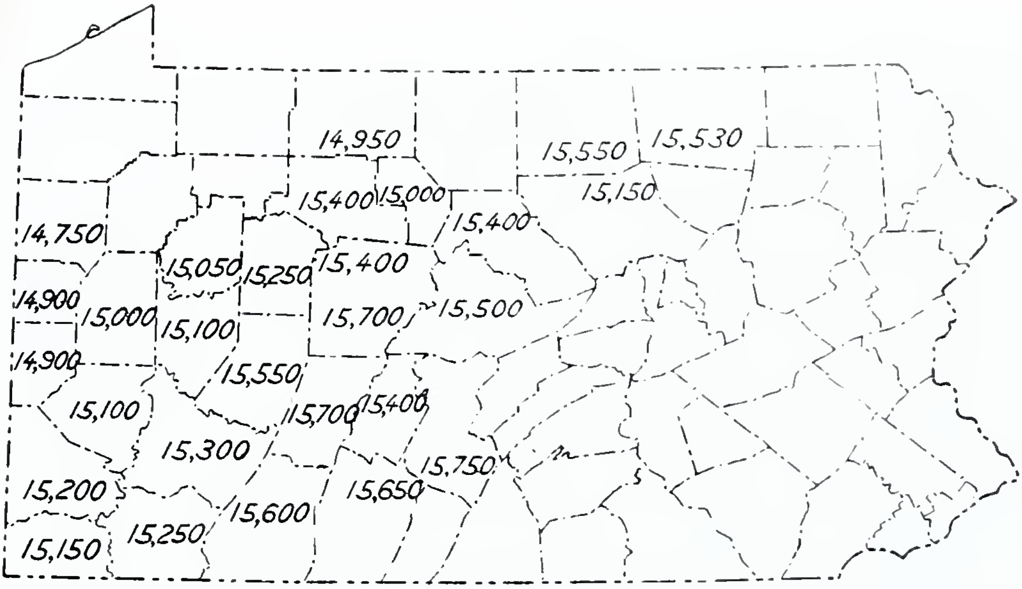


Fig. 25. Sketch map of Pennsylvania showing heat value of bituminous coals.

The actual heat value is lower than the figure indicates, because the determinations are on a moisture, ash free basis. A coal having 15,600 B. t. u. on the dry, ashless basis will have on the as received basis if it contains 8 per cent ash and 2 per cent moisture about

$$\frac{15{,}600 \times 100}{100+8+2} \text{ B. t. u. or about 14,180 B. t. u.}$$

MINING BITUMINOUS COAL IN PENNSYLVANIA.

Notes on history of coal mining in Bituminous Fields of Pennsylvania. The Six Nations conveyed Pennsylvania lands to the Penn proprietaries at various times. In 1758 the boundaries of these lands were established as far west as the "Allegheny or Endless Mountains." In 1768 the Penn proprietaries purchased a broad belt of land from the northeast to the southwest corner of the State including much of the bituminous coal fields. In 1784 the rest of the bituminous coal field, including all of the northwest part of the State, was purchased. The total cost was $10,000. In 1753 the site of Pittsburgh was visited by George Washington who noted its advantages for the location of a fort. History says that at that time no one lived there except itinerant trappers.

1758. Name "Pittsburgh" was used by General Forbes following the fall of Fort Duquesne.

1759. The first written mention of coal in Pennsylvania was by Col. James Burd who saw and burned coal on Coal Run near Brownsville. The fact that he speaks of it as "Coal Run" would indicate that the coal had been seen earlier and had given the name to the run.

1760. Captain Thomas Hutchins reported coal as being mined across the Monongahela from Fort Pitt.

1766. Rev. Charles Beatty described the mining of coal from Coal Hill lying south of the Monongahela across the river from Fort Pitt for use of the garrison at that Fort.

1784. The Penns sold mining rights on the "Great Seam" opposite the town.

1785. First land patented as coal land by S. Boyd near what is now Clearfield and the Indian village of Chincleclanoose.

1786. Pittsburgh Gazette established.
First paper on the geology of Pennsylvania published by Thomas Hutchins describing the rocks at Ohiopyle Falls, in the Transactions of the American Philosophical Society at Philadelphia.

1787. Cannel coal at Cannelton, Beaver County, known to Indians and early settlers. Mined intermittently from then to the present.

1790. November 1st. First furnace and forge west of Allegheny Mountain built on Jacobs Creek by Turnbull and Marmie.

1792. Pennsylvania Population Company organized and took up about 500,000 acres in the Beaver River country and northward toward Erie.
Coal discovered in the headwaters of Tioga River by Patterson Brothers.

1793. Benjamin Franklin wrote a paper on a theory of the earth, published in the Transaction of the American Philosophical Society, Philadelphia.
Connellsville laid out by Zachariah Connell.

1794. First steam engine in Pittsburgh. Coal used in evaporating salt obtained from wells. Coal being produced from pits on both sides of Monongahela River.

1797. Craig and O'Hara located a glass works on South Side opposite "Point" of Pittsburgh to be near coal.

1798. Coal used by Murdock in England for producing illuminating gas.

1800. It is believed that Amos Figard opened a mine on Six Mile Creek in the Broad Top field about this time.

1803. First coal shipped from Pittsburgh by boat, the Louisiana, of 350 tons, ballast in coal, bound down the river for Philadelphia where the coal sold for 37½ cents a bushel (between $9.00 and $10.00 a ton).

1804. A barge load of coal mined just above Clearfield by W. Boyd was floated down the Susquehanna to Columbia and sold.
First rolling and slitting mill at Plumsock, Menallen Township, Fayette County.

1805. First iron foundry at Pittsburgh.

1806. Aaron Bloss purchased land and opened coal mine where Blossburg now is.
1809. William McClure published a geologic map of the United States.
Cambria forge built at Johnstown by John Holliday.
1811. First rolling mill at Pittsburgh.
Outside of Pittsburgh, iron foundries and rolling mills have been established at many points. At this time Fayette County had 10 furnaces, 1 air furnace, 8 forges, 3 rolling and slitting mills, 1 steel furnace, and 5 trip hammers.
The New Orleans, first steamboat built at Pittsburgh, sent down Ohio River.
1813. The population of Pittsburgh at this time was 5,748.
1814. Forty to 50 coal pits opened south of Pittsburgh producing annually about 1 million bushels.
1816. Coke was first made in Pennsylvania from coal in Fayette County on ricks.
1816-17. First rolling mill to puddle iron and roll iron bars, on Redstone Creek.
1817. First shipment of coal from the upper Monongahela River on flat boats.
First use of flat boats for transporting coal down river from Pittsburgh.
1820. Coal mining on a small scale at Coal Centre near Greenfield, Washington County.
1824. The Pennsylvania canal was authorized (from Harrisburg to Pittsburgh). This canal consisted of canals and rivers from Pittsburgh to Johnstown, railroad from Johnstown to Hollidaysburg including 10 inclined planes, canals and rivers from Hollidaysburg to Columbia, railroad from Columbia to Philadelphia; branches to Farrandsville on the West Fork; to Elmira via the North Branch; from Bristol to Easton; Beaver to Erie, and Duncans Island to Wiconisco; total length 907.39 miles.
1826. Five rolling mills at Pittsburgh.
1827. Union Canal made available (built and partly sustained by lotteries) from Middletown on the Susquehanna to Reading, 90 miles, and opening the Philadelphia market to coal from the west.
1828. First cargoes of coal shipped from Karthaus.
1829. Completion of Pennsylvania canal from Pittsburgh to Blairsville.
1831. Silliman's Journal published a letter from Sam Wyllys Pomeroy, Esq., describing the coal region between Cumberland and Pittsburgh.
1832. First detailed geologic section made in Pennsylvania by R. C. Taylor from Philipsburg over the mountain to Bald Eagle Creek.
Survey of the Blossburg region made by R. C. Taylor, also survey for a railroad line from Blossburg to Tioga.
Walter R. Johnson began experimental study of steel making powers of American coals.
Geological Society of Pennsylvania was organized, leading to the establishment of the First Geological Survey of Pennsylvania.
1834. Six hundred miles of canal and 120 miles of railroad finished and way open from Pittsburgh to Philadelphia.
Arbon Coal Company formed at Blossburg for mining coal.
At this time in Pittsburgh there were 18 iron foundries, 11 rolling mills, 120 steam engines.
1835. Coke was used exclusively for the first time for iron making at Mary Ann furnace, Huntingdon County.
1836. First Geological Survey of Pennsylvania established under Henry D. Rogers.
1837. Pittsburgh and Connellsville Railroad chartered.
Coke pig iron made at Fairchance furnace near Uniontown, by F. H. Olyphant.
Ten collieries working in Coal Hill, Pittsburgh, 35 to 40 coal railroads from the Monongahela River reaching back to mines between Pittsburgh and Brownsville.
1838. Three hundred steam engines in use in Pittsburgh. Coal produced this year 357,140 tons of which 70 per cent was used in Pittsburgh.
1840. Railroad from Blossburg to Tioga completed to connect with the Erie Railroad just finished, and first coal shipped from Blossburg by Arbon Coal Company. From this time on Blossburg coal was shipped to all of the Atlantic coast region for blacksmithing and supplied three rolling mills in Troy, New York.
According to U. S. Census Pennsylvania produced 415,023 tons of coal. The industry employed 1,798 men and had $300,416 capital.
1841. Blossburg mines visited by Sir Chas. Lyell, famous geologist.
Locks on Monongahela River begun by Monongahela Navigation Company after U. S. Government refuses to undertake job.
1841-42. Two beehive ovens, the first built in Pennsylvania, were erected on the farm of John Taylor below Connellsville.
1842. First Geological Survey of Pennsylvania stopped for lack of funds.
1844. Publication of Walter R. Johnson's studies of steam tests of American coals.
Locks on Monongahela River complete to Brownsville.

1845. Clay Furnace in Mercer County successfully uses raw splint coal for fuel.
1846. Pittsburgh consumes 464,286 tons of coal and exports 214,286 tons.
1850. Locks completed on Youghiogheny River.
1852. Production of bituminous coal in Pennsylvania about 1,300,000 tons.
1852. Pennsylvania Railroad completed; use Portage Railroad over mountains.
1853. Cambria iron works built at Johnstown.
Lake Superior iron first used in Pennsylvania at Sharpsville furnace, Mercer County.
1854. At this time there were in Pittsburgh 17 large rolling mills, 38 foundries, 12 of which were large, 20 glass factories, 20 engine and machine shops, 5 large cotton factories, 4 large flour mills, and a multitude of smaller plants.
1855. Broad Top coal fields were surveyed by J. P. Lesley.
1856. "Statistics of Coal" published by R. C. Taylor.
Broad Top coal field opened by building of Huntingdon and Broad Top Railroad.
Railroad from Towanda to Barclay opens up Barclay mining district.
1857. Pennsylvania canal sold to Pennsylvania Railroad Company.
1858. Publication by H. D. Rogers of the results of the First Geological Survey of Pennsylvania in 2 large volumes.
1859. The Drake well was drilled near Titusville, producing 25 barrels of petroleum a day.
Completion of Bellefonte and Snow Shoe Railroad and beginning of large scale mining in that district.
1860. First crucible steel mill built in Pittsburgh.
According to the United States Census, Pennsylvania produced 2,690,786 tons of bituminous coal.
1861. Pittsburgh and Connellsville Railroad completed.
Dams on Youghiogheny River washed out by flood.
1869. First mine inspection law in Pennsylvania was passed; applying only to anthracite.
1870. Bituminous coal in the United States for the first time exceeded the production of anthracite.
About 500,000 tons of splint coal were produced in Mercer County for use raw in the blast furnace.
Commercial coal mining began at McIntyre.
1871. Connellsville Railroad completed through Wellersburg basin.
1872. Bennetts Branch Railroad being built.
Low grade division of the Allegheny Valley Railroad under construction.
1874. Second Geological Survey of Pennsylvania was established.
East Broad Top Railroad was built from Mt. Union to Robertsdale.
1875. First Bessemer steel works established at Braddock by Andrew Carnegie.
Natural gas begins to compete with coal in Pittsburgh.
1877. Bituminous mine inspection law for Pennsylvania passed.
1881. Rochester and Pittsburgh Coal & Iron Company formed as a result of reports by the Second Geological Survey of Pennsylvania, and purchase made of 6,000 acres near Punxsutawney.
1883. Buffalo, Rochester & Pittsburgh Railroad reaches coal fields at Punxsutawney.
1884. Natural gas comes into large use in Pittsburgh.

men, weighmen, men to care for the miners' lamps, and if a town is necessary, men to do the necessary work of the town. Usually a town is supposed to pay for itself after the original outlay is made.

No attempt is made here to indicate the actual cost of opening and operating a mine. The coal mining business, like many other lines of business, generally runs on a narrow margin. Poor markets, resulting in idle days during which interest and overhead, pumping and roof protection keep up, for even a few weeks may change profits to deficits. There is no great monopoly in the business. Competition is keen. Sometimes profit or loss is determined by a slight change in personnel of management. It is to be remembered that the cost of mining a 2 foot bed may be double that of mining a 4 foot bed, and that the roof may be good in one part of the mine and extremely poor in other parts; that the percentage of sulphur may be low in part of the mine and high in other parts and may be so high that old markets refuse to take the coal and expensive separation plants may have to be installed. To discuss all of these elements in detail would fill a volume. The writer has covered some of these more fully in several previous papers.*

USES OF PENNSYLVANIA BITUMINOUS COAL.

Coal was probably first used for melting metals. A mine now producing in Manchuria was first worked approximately 3,000 years ago to furnish fuel for copper smelting. Later the same mine furnished coal for burning porcelain. Theophrastus, about 300 B. C., in his book on stones mentions the use of coal by smiths of Italy and Greece. Coal mining began in Europe about 825 A. D., and in America in 1758. Before 1700 coal was used in Europe for house heating, for smelting lead and tin, for ventilating mines, and had been tried in iron smelting. With the invention of the steam engine in 1763 coal became a source of energy. The uses of coal have expanded slowly until coal is beginning to be looked upon as a source of many materials, rather than as something to be burned. These new uses of coal will be described in this chapter.

Coal Used Directly.

House heating and cooking. All of the bituminous coals of Pennsylvania are suitable for house heating and cooking. The coals of the central counties just west of Allegheny Mountain are less smoky than the coals of the western counties; they are softer, break up more readily, and produce large amounts of very fine sizes. Most

*Coal deposits of Indiana, Indiana Department of Geology and Natural History, Annual Report 1898, pages 1490-1517.
The value of public coal lands, U. S. Geological Survey Bulletin 424.
The classification of public coal lands, U. S. Geological Survey Bulletin 537.

of the bituminous coals of Pennsylvania cake or intumesce in burning; they run together when they are heated and make a sticky mass that must be broken up to allow proper circulation of air through the bed of coal. The Sharon coal of Mercer County and a few others of the non-caking type are free burning. Pennsylvania has also a small quantity of cannel coal. It is free burning but it usually yields a long yellow flame and much smoke. Cannel coal has been much used for burning in fire places.

The methods of house heating and cooking with bituminous coal seem likely to undergo very material changes in the near future. Cooking with coal is almost a thing of the past in towns where artificial gas is available. Where natural gas is available it is used for cooking and will be as long as it lasts. Natural gas has long been used for house heating in western Pennsylvania but the gradual exhauston of the supply of natural gas seems likely to curtail this use in the near future. Present prices for natural gas in some towns make its use prohibitive except in properly designed gas furnaces.

Smoke ordinances have been enacted by many cities and much has been done to eliminate smoke, especially from commercial and industrial establishments. It is now clearly recognized, however, that the cities cannot be free of smoke until household fires no longer burn a coal that produces smoke. It is believed that the only solution of the smoke problem is the use of smokeless fuel. The prodution of smokeless substitutes for anthracite is discussed beyond. Combustion engineers believe that manufactured gas will gradually replace coal for house heating in some localities. Heating with gas which sells at $1.00 a thousand cubic feet is approximately equivalent to heating with coal costing $30.00 a ton.

The subject of house heating and house cooling will receive increasing attention in the near future. The producers of anthracite have recently been conducting a successful campaign for the use of the small sized anthracite so that in December 1926 the demand for buckwheat coal exceeded the supply. Pea and nut coal were not in demand. The burning of small sized anthracite has resulted in the adoption of specially designed grates and furnaces, and the use of small blowing fans to create artificial draft. Harrisburg is said to have over 2,000 small fans installed in household furnaces. These changes show the general interest being taken in more efficient household heating equipment and combustion methods. Similar studies and publicity would undoubtedly develop new methods of burning the small sizes of bituminous coal, and create greater demand for them. A new stoker is now on the market which automatically feeds soft coal to a domestic furnace. More automatic devices to eliminate dirt and labor will gradually be invented. The use of gas fired household furnaces is increasing at a rate that is giving

concern to the gas companies of the larger cities, for although the cost of using artificial gas may be double that of using large sized anthracite, the convenience of the gas furnace offsets the greater cost.

Many central heating plants are being installed which furnish heat to blocks of houses or for large districts.

In the future coal will be used for the cooling of houses. Air cooling and conditioning systems are being installed in theatres, public halls, factories, and manufacturing establishments. With so many large installations in sight the manufacturers of such apparatus have had little interest in developing small economical plants for house cooling. Undoubtedly that will be the next step. Whether a single plant will be devised to warm the house in winter and to cool it in summer, or whether summer cooling will use a separate refrigerating system, depending on a central station for power, remains to be seen. A warm air heating system lends itself to cooling in summer with slight change, especially a warm air system using small flues and a drive fan for distribution. Such a system needs only attachment of a cooling plant so that the air which is forced through the house would be drawn through a cooling chamber of refrigerating pipes instead of through a furnace.

House builders are giving much more thought to the heat insulation of houses. Studies have been made and are in progress in several laboratories on the heat conducting character of various building materials. These studies may lead to very material changes in our future building methods and our methods of heating and cooling our houses. They may have a very pronounced effect not alone on our coal reserves but upon the stability of the coal industry throughout the year.

Steam making. Power plants, railroads, and other large consumers of coal determine by experimentation what coal of reasonable price is best suited to their needs, and generally contract for coal for long periods. The consumer either relies on the reputation of the coal companies for producing a uniformly high grade product, or the contracts specify limits of ash and sulphur with penalties for coal that exceeds the limits in ash or sulphur, and premiums for coal that is better than the specifications. A contract of this character requires constant sampling and analysis by both buyer and seller. This may add materially to the cost of the coal. If the needs of a plant or institution do not exceed a few thousand tons a year, the coal should be purchased within the first freight zone. Experience has shown that as a rule the larger producing companies give more attention to producing a uniform product and are in a better position to insure deliveries in case of excessive demand or other unusual conditions, than the smaller producing companies. This method of buying does not require the taking of samples to be analyzed.

The higher the fixed carbon in bituminous coals the higher is the heat value. This is due to the decrease in the percentage of oxygen. Heat is derived from coal by the union of oxygen with the carbon and hydrogen of the coal. The extent to which the carbon and hydrogen of the coal are already united with oxygen and therefore deprived of further heat-giving value is measured by the percentage of oxygen already in the coal. Fresh peat may contain 85 per cent oxygen; presumably much of it in the form of moisture. Lignite contains 45 to 50 per cent oxygen. As the coal rises in rank or class toward anthracite, the percentage of oxygen steadily decreases by the elimination of moisture and the equivalent of moisture in the volatile matter—the inert volatile matter. The moisture in all classes of Pennsylvania coals is 3 per cent or less except in the northwest corner of the State. The inert matter in the volatile matter is less than 20 per cent of the volatile matter. The total percentage of oxygen in the coal is 10 per cent or less. Bituminous coals lose oxygen from west to east. At the western border of Pennsylvania coals contain approximately 10 per cent oxygen, and in the counties along Allegheny Mountain and in the Broad Top field they contain a little over 6 per cent. The B. t. u. value of the coal increases steadily from the western State line to the Allegheny Front. If the coal has the same percentage of ash, the increase ranges from 13,000 to 13,500 B. t. u. for a 7 per cent ash coal in Butler, Mercer, and Lawrence counties, to 14,250 B. t. u. for a 7 per cent ash coal in Cambria and the other counties near the Allegheny Front. Roughly every per cent of ash above a selected standard reduces the B. t. u. value by 1 per cent. In practice the matter is not quite so simple, although the general rule holds that the high-ash coals lose more than the proportional amount in heat value. For example, a 5 per cent ash coal of Cambria County may have 14,500 B. t. u. on the as received basis. An 8 per cent ash coal may have 14,000 B. t. u. instead of 14,077 B. t. u. A 10 per cent ash coal of the same region may have 13,750 B. t. u. instead of 13,800 B. t. u. A 13 per cent ash coal may have only 12,750 B. t. u. instead of 13,420 B. t. u.

Powdered coal. There is a growing tendency today to replace sized or run-of-mine coal with powdered coal for use under the boiler for steam making and generating power. Powdered or pulverized coal is coal that has been crushed to the fineness of talcum powder so that it can be fed into a furnace by compressed air and screw conveyors. Powdered coal can be fed to the combustion chamber of the boiler continuously, thus avoiding the variable heat transfer of a fire that is fed intermittently. It avoids the cooling and loss of heat due to the frequent opening of the furnace door in hand firing, and the checking of the draft when a new layer of coal is spread on the fire. The combustion of powdered fuel is practically complete. High ef-

ficiencies can be obtained over long periods. Powdered coal is particularly desirable fuel for power generating purposes where the load varies suddenly. The rate of charge can be changed instantaneously. Dirty coal can be fired more efficiently in powdered form. High ratings are possible with powdered coal, because it is burned with low excess air.

Coal used for powdering should be low in moisture and should be ground very fine. At least 95 per cent should pass through a 100 mesh screen, 85 per cent through a 200-mesh screen, and 70 per cent thruogh a 300-mesh screen. Some furnaces can use larger coal than others. It is probable that all of the coals of Pennsylvania except those in the northwest corner of the field are low enough in moisture to be used without further drying. Recent experience also indicates that although the grinding must be thoroughly uniform and fine, extreme fineness is not essential to good combustion and good efficiency.

Powdered coal is not quite so easily handled as run-of-mine coal. It is highly explosive and inflammable and if it is stored in bins awaiting use it must not be overheated. It must not be stored near furnances, steam pipes, or other sources of heat.

All coals, even anthracite, may be used in the powdered form. Bituminous coals of Pennsylvania can be ignited readily with burning waste or kerosene torch. Almost all types and grades of coal can be burned in powdered form, but high efficiencies can be obtained only from good grade of coal.

Powdered coal presents three major difficulties. 1. It requires a very large combustion chamber. The combustion chambers of two new boilers of the Duquesne steam plant at Pittsburgh are as large as small ball rooms. 2. Much of the fine ash is carried out of the chimney and settles on the surrounding country, creating an undesirable condition that should be corrected in the early future. Flue dust collectors remedy this condition. 3. The initial cost of the machinery is large and depreciation is rapid.

Powdered fuel makes it possible to use coals high in ash and sulphur so that mines can use bony coal for the production of power at the mine.

Powdered coal has long been used in cement kilns and in metallurgical furnaces. For these purposes, as a rule, a long flame is desired so that high volatile coals only are acceptable for such use. Coal for these uses should have not less than 30 per cent volatile matter, and for some uses, such as the open hearth furnace, coal with 36 per cent volatile matter or higher can be used.

Powdered coal has been used successfully in locomotives and for house heating, especially in large buildings such as hotels, apartments, and office buildings. In some places specially designed tank

cars deliver the powdered coal to special storage tanks near the consumers furnace in much the same way that oil for oil burning furnaces is delivered from a tank car.

Colloidal coal. Two methods have been proposed for converting powdered coal into a liquid that would flow through pipes and seek its own level. Both involve grinding the coal to exceeding fineness. One method proposes to mix with the finely powdered coal some substance that will prevent the coal from settling if it is mixed with a small percentage of petroleum. Experiments conducted during the war by Lindon W. Bates indicate that fine coal mixed with approximately 17 per cent petroleum and a small quantity of fixative remains suspended ready to flow in any direction. The action of the fixative is to produce a jel or jelly-like condition which holds the fine particles of the coal is suspension. The quantity of pulverized coal in the mix depends on the viscosity of the oil and the temperature of the mix. Forty per cent of coal may be added to a light oil and the mix has a viscosity equal to a heavy oil. At 68° F. the viscosity will hardly be below 65 per cent Engler and may average between 160° and 350° Engler. When it is passed through a preheater this mix acts like a light oil. It has the advantage of being heavier than oil and has a higher B. t. u. value. It can be stored under water. If 75 per cent of coal is used the mix has the consistency of a paste, which when heated, liquifies and can be atomized for burning. The essential part of the process is the introduction of a small percentage (one-fourth to one-half per cent) of fixatur, peptizer, or stabilizer that prevents the settling of the larger particles of the coal and keeps the mix in a fluid, pasty or gelatinous condition. The nature of the substance which was used has remained a secret although many substances have long been known and have been used with graphite, lamp black or charcoal reduced to colloidal sizes, such as gelatines, glues, gum arabic, sodium oleate, and dextrin. The problem here, however, is to hold in suspension particles above colloidal size.

The second process consists of grinding the coal so that it goes through a 500-mesh screen. This material, if slightly heated, gives off gas freely. This action is supposed to make it flow readily through heated pipes and to seek its level like a fluid. This process has been developed by the Trent Corporation. These newly discovered properties of coal may open the way for the use of coal in much the same way that oil is now used under boilers. Experiments have been made in the use of very finely pulverized coals, very low in ash, in internal combustion engines. The small quantity of ash is blown out of the cylinders with exhaust gases.

Coal and power production. Advances being made in the use of coal both for heating and power production play an important part

in the mining industry. During the last century the prodution of coal approximately doubled itself each 10 years. In 1840 the production figures for Pennsylvania were 464,826 tons; in 1850 1 million tons, much more than double; in 1860—2,690,786 tons, again more than double; in 1870—9,040,569 tons, or more than 3½ times; in 1880—18,425,163 tons, just about double again; in 1890 42,302,172 tons, more than double; in 1900—79,842,326 tons, for the first time not quite double. In 1910 the production was 150,521,526, nearly double that in 1900. Then the production curve suddenly flattened out. In 1920 production was only 170,607,147 tons, only a little larger than in 1910. The production of 1920 has only once in the last 6 years been approximated. Had the old curve of production continued the production in 1920 should have been 300 million tons and in 1925 450 million tons instead of an actual production of 140 million tons. While other factors have had a part in this remarkable change, with its obvious bearing on the life of the coal field, probably the largest factor has been the change in the efficiency with which coal is being used in the production of power.

The advance in efficiency in the use of coal for power has been stated by George A. Orrok as follows: "The Savery engine built about 1660 required 100 pounds of coal per HP (horse power) developed. Newcomens' engine of 1750 used 22.1 pounds of coal per HP. James Watts improvements reduced the rate to 3.26 pounds per HP. Bruno Nordeberg's Wildwood pumping engine used 1.2 pounds per HP. Today some central stations run on about ¾ pound per horse power. Or stated in B. t. u. per Kwh. (Kilowatt hour) Savery's engine used 1,880,000 B. t. u. per Kwh., Newcomens 416,000 B. t. u., Watts best record 61,000 B. t. u. Central stations today range from 30,000 to 18,000 B. t. u. per Kwh., though today there are three power stations using only 14,000 B. t. u. per Kwh. for a period of time."

These results are due to a vast number of changes, mostly minor, although a few are revolutionary. The introduction of the condensor; of the double, triple, and quadruple expansion engine, and of the turbine are the major changes. Along with these major changes have come a multitude of minor ones, all of which save some of the heat or energy which is otherwise wasted; such as preheating from waste heat, and the use of high pressure and temperatures. Notwithstanding all of these advances the heat efficiency of the best of these engines is barely 24 per cent. Only 24 per cent or less than ¼ of the heat energy in the coal is realized in mechanical electrical energy.

The use of mercury in place of water for part of the cycle, and the combustion of fuel mixed with air under water are other forms of experimentation. In the mercury engine the saving is made by using vapor at high temperature. The heat which is extracted in

condensing the mercury is used to make steam at a lower temperature. It is believed that the mercury engine has an efficiency of 30 per cent or better.

If coal is converted into gas or oil and burned in internal combustion engines efficiencies are greater than if it is used in its raw state. It is believed that by converting coal into gas, using the gas in an internal combustion engine, and using the waste heat from the latter to produce steam for use in a steam turbine, an efficiency of 25 per cent or better may be obtained.

The recent large saving in coal is due not alone to the greater efficiency of its use but also to the replacement of old inefficient engines by power from central stations using highly efficient plants. During the last 15 years there has been a very large shift of power usage from privately run inefficient power plants to power purchased from central stations. Even among central stations there is seen a steady increase in efficiency through the building of more efficient units or plants and the abandonment of less efficient plants or units. Thus on the average in the United States electric light power companies used 2.4 pounds of coal per Kwh. in 1923, and in 1924 that amount was reduced to 2.2 pounds per Kwh. In 1918 3.2 pounds of coal were required to produce 1 Kwh. of electricity. Just how much this saving mounted to can be expressed in another way. In 1924 the electric light and power companies produced 2,706,000,000 more kilowatt hours than in 1923 yet used 392,000 tons less coal.

Similar changes are going on in the use of coal by railroads. It is reported that in 1925 it required 159 pounds of coal to haul 1,000 tons of freight and equipment (exclusive of engine and tender) one mile. In 1924 it required 170 pounds; in 1923 it required 183 pounds. Efficiencies have increased rapidly in the last five years.

One phase of this subject which has been much discussed in recent years is the location of power plants at the mouth of the coal mine. At least two such plants are operating on a large scale in Pennsylvania today and there are others in nearby territory. Placing the power plant at the mine mouth saves freight on the coal which reduces the cost of the power to the consumer by reducing the cost of its production. There are certain factors often overlooked by those not familiar with the problem. First is the water supply. A modern condensing engine requires from 500 to 1,000 tons of water for each ton of coal. A large power plant can therefore be located only on a large river. The use of spray or cooling ponds involves a large additional cost upkeep, and the loss of vacuum. These additional costs may amount to as much as 10 or 15 per cent of the value of the power that could be produced. The cost of transmission of electricity is well known today and is large. The largest unknown factor is the cost and supply of fuel. A large power plant using

from 2,000 to 5,000 tons of coal a day diminishes its coal supply very rapidly. An acre of 3 foot coal should yield 4500 tons of coal, at the rate of a 1500 ton recovery per acre foot. A plant drawing from a 3 foot bed is likely to exhaust an acre a day or 365 acres a year. A 50 year supply means exhausting a square mile of the bed each two years or 25 square miles during the life of the plant. If the bed is 6 feet thick, the power plant would exhaust 12 square miles of bed in 50 years. This is a much larger area than is generally mined from one opening so that after a few years the cost of haulage from the mining face to the power plant might equal the cost of freight. There is also the uncertainty always attendant on depending on one source of supply as compared with being in a position to draw on diverse supplies. The best evidence that expected saving by placing the plant at the mine mouth is not always to be realized in practice is the fact that a number of recent installations of giant power stations in which this matter was thoroughly considered have resulted in the plants being built near water and markets rather than near the coal supply. Examples are the Avon station of Cleveland, built on Lake Erie, and the New Commonwealth-Edison plant at Chicago, on Lake Michigan. Apparently the only places in Pennsylvania offering advantages for such installations are along the Monongahela, Youghiogheny, Allegheny and Ohio Rivers. Along the Allegheny River the only area favorable for a mine mouth power plant is in the region of the thick Freeport coal bed, and this territory is now being drawn upon by two mine-mouth power plants.

Industrial heating. Coal is used directly for many purposes other than house heating and steam making; for blacksmithing, metallurgy, burning brick, cement, lime and in the production of fertilizer.

Blacksmithing. Coking coals of many kinds have been and are used for blacksmith work, but all coking coals are not equally well adapted to such use. A blacksmith coal must be low in sulphur, preferably under 1 per cent, so low in ash (preferably under 7 per cent) that it will not make a dirty fire, and low in moisture. A low moisture coal is better than a high moisture coal. Experience indicates that low volatile coals ("lovol") are better than medium or high volatile coals. The coal must produce a good hard coke that will form an arch quickly, that will not disintegrate under the air blast. Coals from Blossburg and points in Cambria and Somerset counties are used extensively for blacksmithing, and are shipped as far as San Francisco for this purpose.

Metallurgical fuel. A coal suitable for metallurgical use should be high in volatile matter and low in sulphur and phosphorus. High sulphur coals may be used for smelting copper and iron, and in refining copper. A metallurgical coal should be high in volatile matter, low in sulphur, ash and moisture.

Burning brick, cement and lime. For these purposes a high volatile coal with long flame is preferred. Coals of any sulphur content may be used for burning common brick and ordinary tile. Low sulphur coals are necessary for light-colored brick or pottery or in the manufacture of cement. In the manufacture of white cement oil is generally substituted for coal in order to prevent possible discoloration of the cement by sulphur fumes. A low ash coal should be used for burning pottery as the ash carries into the kiln and lodges in the pottery and may discolor it or affect the brilliance of the glaze. For cement burning ignited pulverized coal is blown through the rotary kilns.

The combustion of coal. The combustion of coal comprises two major events, (1) the combustion of the gaseous products which are distilled off when the coal is first heated, (2) the combustion of the incandescent coke left after the volatile matter has been driven off. When fresh coal is fired in the furnace, moisture is driven off, followed by combustible gases and tarry vapors. These gases consist of methane, with smaller proportions of ethylene, benzene, and ethane, hydrogen and carbon monoxide; the tarry vapors may carry off a certain proportion of finely divided carbon or soot. It is believed that these gases absorb oxygen and form a succession of hydroxyl groups finally ending in producing CO_2 and H_2O before they are heated to the ignition point (750 to 900° F.). If the gases are brought at once to the ignition temperature the same changes may take place but so quickly that the gas appears to change at once into CO_2 and H_2O. The changes involve the production of (1) methyl alcohol, (2) an unstable dihydroxoid compound, (3) steam and formaldehyde, (4) formic acid, (5) CO and H_2O, and (6) CO_2 and H_2O.

High temperature and sufficient oxygen are necessary for complete combustion. An insufficient supply of oxygen at the top of a fire causes incomplete combustion and the formation of CO and soot. If too great a supply of cold air is admitted to the top of the fire the gases are cooled below the ignition point and incomplete combustion and smoke ensue.

A study of the burning of the incandescent coke in the fire box is even more difficult. The evidence available today indicates that all of the oxygen in the air that comes through the grate bars is probably used in the lower layers of fire Combustion is thought to form both CO and CO_2; the proportions depend upon the quantity of oxygen available, the temperature of the air and fire, and the existing pressure. Apparently the proportion of the two gases may vary greatly in different parts of a fire; usually, however, they reach the top of the fire with a large proportion of CO (up to 90 per cent) which burns to CO_2 within a few inches above the surface, at which point the flame is hottest (2200° to 2700° F.). The temperature of

the fire may be so close to the critical temperature that the same gas changes from CO to CO_2 and back to CO in passing through the fire.

The smoke of combustion comes from the incomplete combustion of the tarry vapors which, because of their more complex composition, do not readily combine with oxygen. The complete combustion of these vapors requires the proper proportion of oxygen and a temperature above the temperature of ignition. Combustion is often aided by preheating the air, which otherwise might cool the gases, or by the use of an incandescent brick surface or arch upon which the gases impinge.

In general the primary function of a furnace is to distill off combustible gases which are to be burned above the fire or in the flues of the boiler. Many furnaces are designed so that the first products of combustion passing direct to the flues of the boiler or furnace are carried over an incandescent fuel bed and burned before there is any possibility of their escaping.

The smoke nuisance and its abatement. Smoke is the result of incomplete combustion. There are two ways of abating it—by using smokeless fuel or by complete combustion of fuel. At a recent conference in Pittsburgh it appeared to be the concensus of opinion of those attending that the only way to really rid our cities of smoke is to provide an abundance of smokeless fuel and to prohibit the use of any other type. It is generally recognized today that smoke is costing the cities many millions of dollars. Local estimates have indicated a cost of $5.00 to $20.00 a year for each person, not taking into account the effect on health. Many cities have smoke ordinances and officials charged with their enforcement. These laws have in many places caused an appreciable curtailment of the smoke nuisance through the gradual installation of better constructed furnaces, training of firemen, and the substitution of power from large public service power stations for locally generated power. A continuance of these measures will still further curtail the smoke of our cities, especially when they are assisted by the electrification of railroads. A very large quantity of smoke from household fires and furnaces cannot be readily eliminated. Anaylses have shown that, whereas soot from a boiler chimney where there is a strong draft may contain 60 to 75 per cent ash and 15 to 30 per cent carbon, soot from household chimneys may contain only 5 to 20 per cent ash, 1 to 40 per cent tar, and 35 to 80 per cent carbon, and four times as much ammonia as soot from the boiler's chimney. It is obvious that our cities will not become smokeless until domestic fires become smokeless. Two methods have been proposed to secure that end: the use of anthracite or of carbonized bituminous coal, and the use of furnaces designed to first distil off the volatile hydro-

carbons and then secure their complete combustion. Several household furnaces have been designed with this end in view, such as underfeed furnaces in which small sized coal is fed to the fire from below by means of a plunger operated from the side of the furnace. The use of smokeless fuel, either natural or artificially prepared, seems to be the best solution of the problem.

A related problem that is growing and which must be solved in the near future is the disposal of the ash which is blown out of chimneys, especially where powdered fuel is used. Such ash is cleaner than carbon soot and does not stick to objects as does the tarry soot from household smoke. On the other hand it consists largely of silica and silicates which are believed to be much more dangerous to the lungs than the high carbon smoke. Doubtless a few years will see various methods of precipitating ash being installed in the smoke stacks of large plants. Better methods of removing the ash from the coal are already being introduced.

The carbonization of coal, by which the volatile matter and tars are at least partly driven off, is closely related to the recovery of the gas and other by-products and presents a very large problem. It is treated more in detail beyond.

Coal Used Indirectly.

There is a widespread belief that the direct burning of coal may soon become a thing of the past. This is due to the growing recognition of the value of the by-products obtainable from coal when it is heated or distilled in a retort. When coals are so heated they yield combustible gas, tar or oil, ammonia and coke. A very large number of coal tar products are produced from the tar or oil, including oils, dyes, preservatives, explosives, disinfectants, medicines, photographic materials, roofing and paving materials, and other materials from saccharine for sweetening to creosote and tarvia. TNT is a coal tar product; picric acid, analine dies, moth balls, carbolic acid, vaseline, cold creams and perfumes, blueing and soap are numerous commodities derived from coal tar. Ammonia is the basis of sal ammonia, ammonium sulphate, fertilizers, battery liquids, and other products. The gas and coke are well known substances.

The quantity of these primary substances which are produced depends on the temperature to which the coal in the retort is subjected. If the temperature is high (above 1500° F.), the volume of gas is large (11,000 to 13,000 cubic feet per ton) but has low heat value (450 to 600 B. t. u. per cubic foot) and the liquid products small (8 gallons) and of high density; the quantity of sulphate of ammonia is large (25 to 28 pounds). If the temperature of the coal in the retort is low (500 to 1,000° F.), the quantity of gas is small

(5000 to 6000 cubic feet), but of high heat value (700 to 750 B. t. u.). The quantity of tar and oil is large (18 to 20 gallons), the amount of ammonium sulphate small (15 pounds). The high temperature tar yields 1½ gallons of motor oil, a little fuel oil, and a large quantity of naphthalene. The low temperature tar yields 2 to 4 gallons of motor spirits, 8 to 9 gallons of fuel oil, and the residue is lubricating oil. During recent years interest in low temperature distillation of coal has grown, and elaborate studies have been started in the United States, in England, France, and Germany, for the purpose of converting coal into oil and gas on a large scale.

Coke making probably began in the middle of the seventeenth century. According to a note in the diary of John Evlyn, to which my attention has been called by W. E. Fohl, Sir J. Winter in July 1656 charred "sea coal" in earthen pots like those used for glass making. The partially coked coal was used in making a chamber fire which, because of the process, was free of sulphur and arsenic. Another undated note tells of Lord Dundonald (1775 to 1860?) reviving the project and proposing to extract and save the tar, the charred coal being sold as coke. Coke was made for a long time in ricks, then in beehive ovens, then in Belgian ovens which were heated by burning the gas driven off from the coal, and finally in by-product ovens in which all by-products are saved.

Illuminating gas was first made in 1798. It has been largely replaced by electricity. Artificial gas is made and used principally for cooking, heating water, and minor heating.

Gas making. The character of the gas obtained from coal depends upon the process used, the temperature obtained, and numerous other factors. The products may be coal gas, water gas, semi-water gas, by-product-coke-oven gas, oil gas, producer gas, or acetylene.

Coal gas is made by heating coal in an air-tight fire clay retort to a temperature of approximately 1800° F. for about 4 hours. The gas is then withdrawn and cleaned. As the coal is heated, gas is driven or drawn off by exhaust fans leaving coke (gas-house coke) in the retort. This is withdrawn and a new charge of coal inserted. The gas, after passing through the exhaust fan, goes first to a condenser where it passes through pipes surrounded by water which cools the gas, condenses out the tar and oil which drips to the bottom and is removed. It then goes to a scrubber, a cylindrical tower filled with wooden slitted trays where dripping water absorbs the ammonia. Then the gas goes through a purifier, a box partially filled with iron oxide which removes the sulphur.

The manufacture of by-product-coke-oven gas differs from the manufacture of coal gas only in that the primary product is coke and the gas is a by-product. Part of this gas is used in the process of coking; part of it is used in the steel plants where much or most

of the by-product coking is done and any surplus may be used for other manufacturing plants or for distribution through the city mains.

Blue water gas is made by drawing steam through a large chamber filled with glowing hot coke. The water is broken up into hydrogen and oxygen and the oxygen unites with the carbon of the coal to form carbon monoxide (CO). As the coke is cooled the steam is shifted to another coke chamber and the first chamber is reheated by blowing air through it. This gas is also sent through a scrubber, condenser and purifier. Water gas is generally enriched either by mixing with coal gas or by spraying oil into it. It is passed through a chamber containing a checkerwork of brick so highly heated that the oil is broken up into fixed gases. This increases the heat value of the gas and gives it luminous qualities and an odor that is of value from the safety standpoint. When enriched it is known as enriched or carburetted water gas, semi-water gas, Dawson gas, and Rose-Hastings gas. There are many modifications in the methods of making coal gas and water gas. Among these are several that make water gas manufacture continuous by driving air and steam through the chamber of incandescent coal or coke. The oxygen of the air combines with the coke and maintains its incandescent. The resulting gas contains of course a large percentage of nitrogen and is therefore of low heating value. One difficulty formerly met in making water gas is the clinkering of several tons of ash each day. The clinker must be removed often with great labor. This problem is now thought to be solved by a self-cleaning generator base.

Acetylene gas has the formula C_2H_2 and is made by the action of CaC_2 or calcium carbide on water. The recent notable extension in the use of this gas is due to improved methods of producing CaC_2 on a commercial scale. This is done by the action of a powerful electric arc on a mixture of powdered coal or coke and lime. The two substances are mixed in the proportion at $87\frac{1}{2}$ pounds of lime to $56\frac{1}{4}$ pounds of carbon which yields theoretically 100 pounds of CaC_2, the rest passing off as CO. Carbide yields acteylene gas C_2H_2 and $CaO.H_2O$ in contact with water. This gas is used in the form of carbide in open mine lights.

Both coal gas and water gas are stored in tanks. These tanks consist of a large stationary tank within which is a slightly smaller inverted tank which is free to rise and sink but is separated from the large tank by a water seal. Gas admitted within the free tank above the water raises the tank. The weight of the tank, usually augmented by additional weights, gives pressure to the gas that forces it through the city mains to the consumer. Manufactured gas as generally delivered to the consumer consists of a mixture of coal gas, water gas, and oil gas, made as described above and of by-product-coke gas where it is available.

Producer gas is a third type of gas that is used where little or no transportation is involved. This is made by forcing air through an incandescent mass of coke. Thus CO is formed which is mixed with the nitrogen of the air. By preheating the air and adding steam to correspond with saturation at 80° F. nearly two-thirds of the nitrogen in the fuel may be obtained as ammonia which is removed and recovered as ammonium sulphate. Because of the large volume of nitrogen in the gas, the heat value is small (150 to 185 B. t. u.). Attempts to absorb or withdraw the rest of the nitrogen have not been successful. Its low heat value and the large volume that must be used to get much heat prohibit the use of this gas where transportation to a distance is involved. The process of making producer gas converts practically all of the coal into fixed gases.

Approximate heat value of 1 cubic foot of gas.

	B. t. u.
Natural gas	1100
Coal gas	460 — 730
Water gas	320
Enriched water gas	650
Producer gas	150
Acetylene gas	1476

The apparent advantage of the high B. t. u. gases is largely counterbalanced by the larger volume of the low B. t. u. gases. One ton of coal high in volatile matter is estimated to yield gas volume as follows:

Gas yield from one ton of hivol coal.

Kind of gas	Volume in cubic feet	Heat value per cubic foot in B.t.u.	Total heat value per ton of coal in B.t.u.
Coal	8,000–12,000	730	8,760,000
Water	40,000	320	12,800,000
Water gas, enriched	64,000	650	41,600,000
Semi-water	150,000	180	27,000,000
Producer	170,000	150	25,500,000
Acetylene	13,300	1,476	19,630,800

The manufacture of water gas and producer gas uses up all of the coal, including the coke, and saves the marketing of the coke. Coal is first used in producing coal gas in the usual way, then the hot coke is withdrawn from the retorts and is transferred at once to water gas retorts and used in making the water gas. In certain processes, all of the material is gasified in a single retort. Because of the low heat value of water gas and producer gas they can be used only at or near the point of production.

At the present time gas engineering and the production, transportation, and use of gas is a very live subject and is the object of much experimental study. This study is likely to lead to very great changes in present practice. Electricity generated by steam can deliver to the home or industrial plant only about 2,250 B. t. u. of the 14,000 B. t. u. in the coal; modern gas plants may deliver 9,000 B. t. u. from the same coal.

At the present time the production of enriched water gas is more than half the total of all manufactured gas. The price of gas oil, because of its value for gasoline in modern cracking processes will tend to make its use prohibitive, if the price of manufactured gas does not rise to a corresponding value. Already the trend is to a larger use of coal in place of gas oil. The discovery of a substitute for gas oil is one of the technical problems facing the industry.

Coke making. The manufacture of coke has been in progress for several centuries. Coal was first coked to sweeten it by removing part of the sulphur and arsenic and to reduce the smoke. Coke was later found to be suitable for the metallurgy of iron and for a long period that has been the principal, and part of the time, the only use of coke. In recent years there has been a growing demand for coke for household use. Gas-house coke and by-product coke are not as well suited for household use as low volatile coal because of their bulk, open structure, and lack of volatile matter. The coal industry is definitely turning its attention to experimental work, seeking to produce a dense, low-volatile coke or sintered coal to serve as smokeless fuel. The method of manufacturing coke is well known and needs only a brief discussion. The beehive oven is an arch-roofed, circular brick room with an opening at the top and another at the front. Beehive ovens are usually built in banks or long rows side by side with a track built on top of a line of ovens. The ovens are charged by a lorry which runs on top of the ovens. The lorry stops at the opening at the top of the oven and discharges its load of coal into the oven. In a well built behive oven 70 to 72 per cent of the coal is burned into coke; 28 to 30 per cent of the coal is wasted in smoke.

In a by-product oven the coal is charged into a long narrow (18 inches) vertical chamber which can be opened at both ends. Coking is done by burning part of the gas which is driven from the coal in the space between the coking chambers. As the chamber is sealed practically tight the gases from the heated coal are drawn off and the oil, tar, and ammonium are removed in the same manner as in making artificial gas. When the process is completed a large power pusher is moved up to one end of the chamber and the coke is pushed out into a waiting car that is first moved to a quenching building at the end of the line of ovens and drenched with water. One of

the problems of the coke manufacturers is to find a way of cooling the coke without the waste of heat now lost in clouds of steam as the red-hot coke is covered with water. Furthermore, the production of steam in this way aids in the rusting of near by equipment. Experiments are in progress on dry cooling, in which the gases which are driven off of the fresh coke are drawn through a boiler and absorbed by water, producing steam for heating or power purposes.

In the by-product oven the wall temperature is about 1000° C. When the coal has a temperature of 375 to 400° C. it becomes soft and pasty. For a time it boils as the gas is driven off; then it solidifies into a spongy solid. The process requires only fifteen hours as against 48 to 72 hours of the beehive oven. Coals which tend to become frothy during the period of softening are often preheated to drive off some of the materials that prevent their making a good coke. A bank of ovens and recovery plant represents a very large outlay of capital. On the other hand the by-product oven permits the use of high volatile coal with a larger recovery of by-products. Aside from the value of the by-products, the by-product oven is estimated to require 200 pounds less coal to produce a ton of coke than the beehive oven.

The following figures show the by-products recovered from a typical mixture (85 per cent high volatile coal, and 15 per cent low volatile coal).

Products from 1 ton of coal in by-product oven.

	Per cent of coal		Per net ton
Metallurgical coke	69	Gas for heating ovens	4400 cu. ft.
Domestic coke	2	Surplus gas, used and sold	6600 cu. ft.
Breeze	4	Tar	9 gal.
		Ammonium sulphate	25 lbs.
		Pure benzol	2.08 gal.
		Pure toluol	0.56 gal.
		Pure xylol	0.32 gal.
		Crude solvent	0.40 gal.

In 1924 these by-products sold about as follows: Tar 5 cents a gallon; ammonium sulphate 2½ cents per pound; gas used and sold valued at 16 cents per 1,000 cubic feet; the oils had an average sale price of 16 cent per gallon; naphthalene 1½ cents per pound. Of the 541 billion cubic feet of gas produced in by-product ovens in the United States in 1924, 301 billion cubic feet were used or sold for purposes other than the production of the coke. Sixty billion cubic feet were distributed through city mains; 187 billion cubic feet were used in steel or affiliated plants, 29 billion cubic feet were used under boilers, and 18 billion cubic feet were sold for other industrial uses.

By-product coking began in America at Syracuse, N. Y. in 1893. In

1896 a by-product coke plant was built at Boston for supplying domestic gas. The third plant and the first to be built in Pennsylvania was built at Glassport in 1916. The first unit (640 ovens) of the Clairton plant was built for the Carnegie Steel Company. Today this plant is the largest in the world, having, with additions now under construction, 1482 ovens with a daily carbonizing capacity of 30 thousand tons of coal from which it is estimated will be recovered daily 22 thousand net tons of coke, 216 million cubic feet of surplus coke oven gas, 360 thousand gallons of coal tar, 750 thousand pounds of ammonium sulphate, and 90 thousand gallons of benzol. It requires a 40 inch main to carry the by-product gas to the open hearth furnaces. The production of by-product coke in the United States passed the production of beehive coke in 1919, and in Pennsylvania in 1925.

Coke produced in Pennsylvania, 1923-26, in short tons.

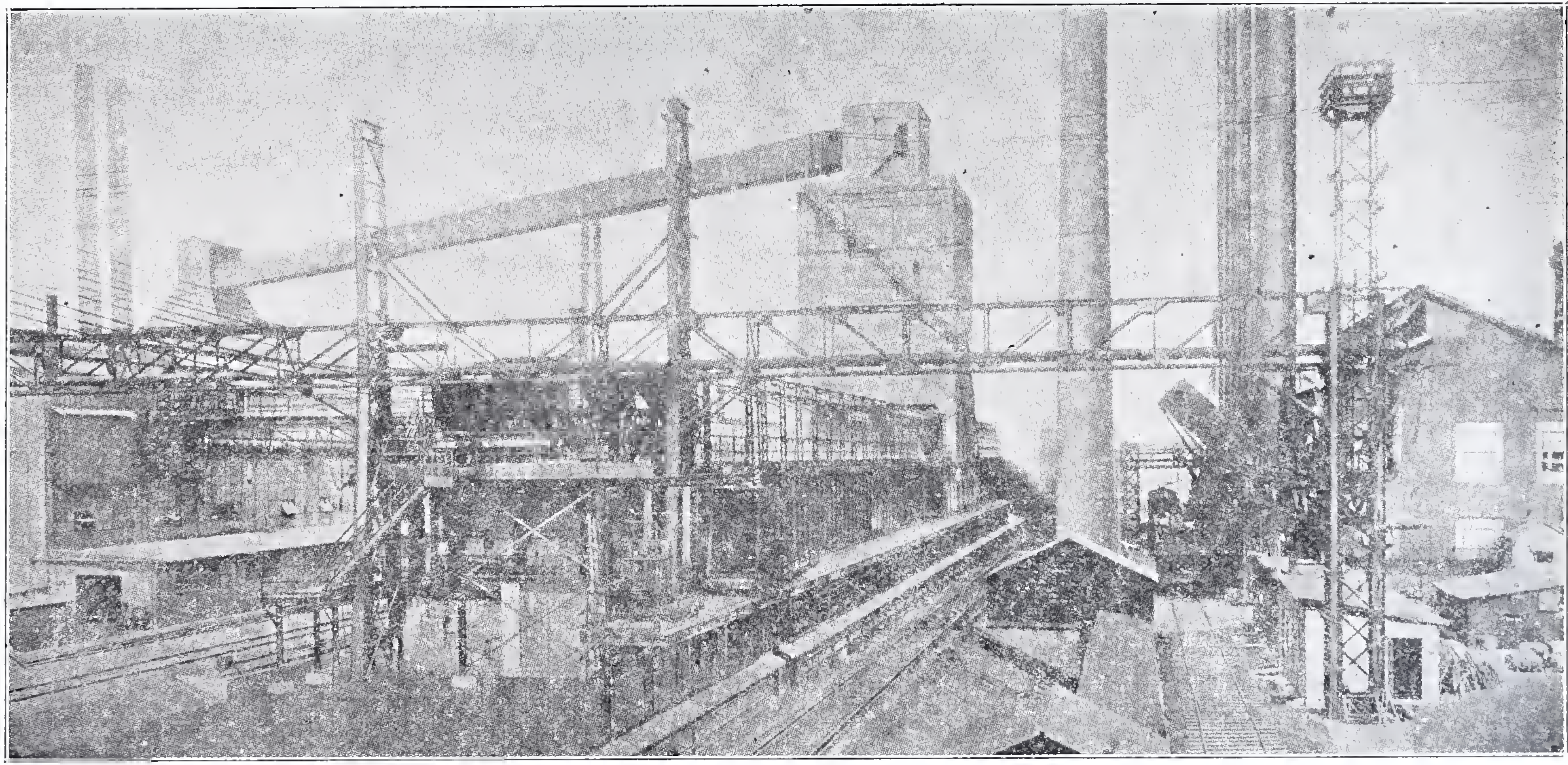
	Beehive	By-product
1923	16,438,539	9,185,747
1924	8,501,282	8,426,155
1925	9,574,341	9,583,262
1926	9,329,000*	11,200,624

Plate XVII. By-product coke ovens. In this picture the by-product ovens are in the center and stretch backward under the tall building. The ends of the ovens show behiud the platform. The ovens are about 35 feet long aud 18 or 20 inches wide. An enclosed bridge leads from the top of the central tower over to the top of another building at the left, near the two stacks. In the building at the left coal is received and ground ready for coking. It is then raised to the top and carried by eudless couveyor through the enclosed bridge to the top of the tower in the center of the picture. This is a storage bin which feeds from the bottom into a battery of lorries that run on tracks along the top of the ovens. These lorries fill the individual coke ovens through openings in the tops of the oveus. The coal is coked by heat supplied by bruning gas iu chambers between the ovens. The gas which is driven from the coal in each oven is carried by a large pipe (not shown in picture) to the building to the left, and the tar, oils and ammonia are recovered. When the coking process is completed a ram mounted on a travelling carriage that runs on the tracks shown on the left of the ovens is placed opposite the end of the oven. The doors at both ends of the oven are removed. A guide, shown on the platform at the right of the oveus in the foreground, is placed opposite the right hand end of the oven and the pusher shoves the glowing coke through this guide into a quenching car which runs on the tracks in the immediate center of the picture. (Notice coke being pushed from the oven beyond coal storage tower.) When all of the coke in an oven has been pushed into this car it is run back to a quenching house where it is drenched with water. The cooled coke is then dumped into storage bins.

The individual ovens are very narrow, as may be judged from the narrow character of the coke guide that runs on the platform. This narrowness is necessary in order that the heat of burning gasses between the ovens will coke the coal thoroughly in a relatively short time. The power house is at the right hand side of the picture. The boilers use the gas which is driven from the coke in the process and in turn furnish power for the operation of the coke oveus and for all of the operations of the mill of which the coke ovens are a part.

*Includes Ohio.

PLATE XVII



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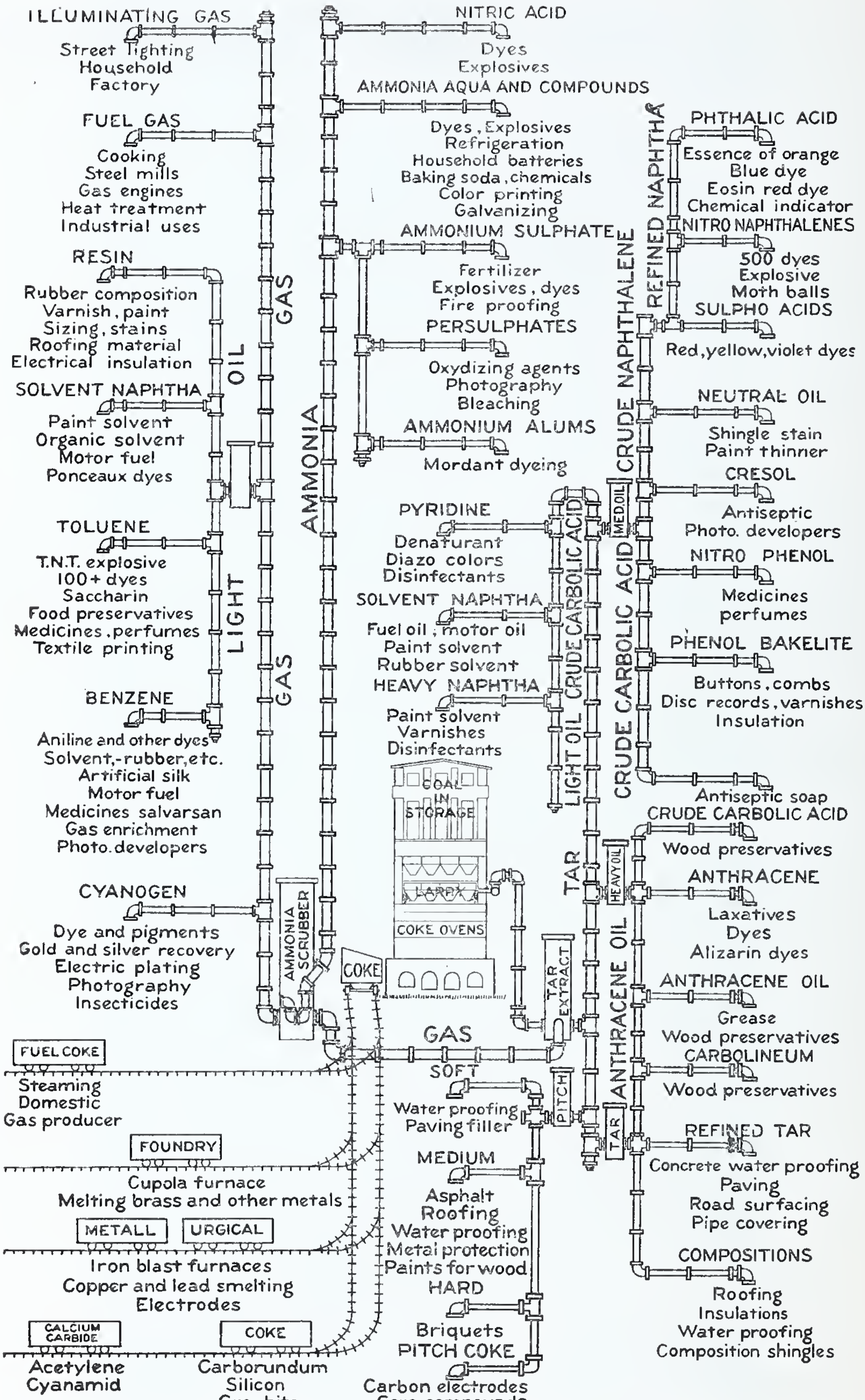


Fig. 28. Chart of uses of coal distillation products.

It is generally true that a falling off in the production of coke has little effect on the by-product ovens as the loss is almost entirely in beehive coke, as in 1924.

Low-temperature coking and smokeless fuel. Great interest has been given in recent years to low temperature distillation of coal. The demand for a smokeless fuel to be used in place of anthracite and replace the use of raw high volatile coal in cities is becoming greater. The belief that the apparently limited supply of petroleum in the ground will in a few years fail to meet the growing demand for motor fuel, has also aroused interest in low temperature distillation.

This has led to large scale experiments in some of which the primary purpose was the production of a smokeless fuel and in others the primary purpose was to reduce the cost of fuel by the preliminary recovery of valuable by-products.

High-temperature distillation produces a heavy tar and little oil, and low-temperature distillation yields a much larger percentage of oil. Furthermore, high-temperature distillation produces a coke with little or no volatile matter, which is therefore not an ideal household fuel. Low-temperature distillation produces a semi-coke containing any quantity of volatile matter desired. Much of that produced, particularly for household use, is 12 to 15 per cent in volatile matter.

The production of low-temperature coke has, however, proved to present many mechanical difficulties, if a continuous process is to be achieved; for as the coal is heated it swells and for a time turns into a sticky mass that is very hard to handle mechanically. Furthermore, the coke, to compete with anthracite, should have a greater density than most of the ordinary cokes.

Experiments have been along several lines. In general, however, the coal is heated in a chamber or retort so narrow that the heat will rapidly penetrate to the center. The process is quick and does not require a very high temperature of the retort walls which tends to produce high-temperature coke and its by-products. Some method for moving the coal through the retort must be provided.

In several of the processes the coal is fed to narrow vertical retorts in which it is coked, then is dropped or forced down into a receptacle. The by-products in gaseous form are withdrawn as in the high-temperature coking process. The coalite process of England is an example of this type. In the Peron-Caracristi process of the Ford Motor Company the crushed coal is fed into shallow bins 5/8 of an inch deep. The bins form a continuous chain belt that is drawn over a bed of melted lead. The lead is kept molten by the circulation of burning gas from the coking, in flues through the lead. The volatile matter is drawn off, the semi-coke is discharged

as the belt turns down at the end of the furnace. The capacity of the process is small but it is rapid, so that the total production may be quite large.

In the Greene-Laucks process the coal is fed to the bottom of a retort which consists of an outer shell and an inner (revolving) vertical flue between which is a spiral fin. The coal is fed into the bottom and moves up this fin, being heated from both inside and outside flues. The flue walls prevent expansion of the coal as it softens and tends to expand, so that the finished product at the top is a dense, hard, semi-coke or charred coal.

The Carbo-coal process is different from those which have been described. The coal is first semi-coked in a horizontal retort by being pushed along by oscillating paddles. The product is a granular semi-coke. This is then briquetted and the briquets re-coked to remove the tar and produce a fuel of the desired volatile content (12 to 14 per cent). Other processes use rotating retorts or internally heated retorts in which the coal is fed into a vertical shaft through which the preheated vapors and gases ascend and heat the coal. This method is not suited to strongly fusing coals. In the Parr and Laing process the coal is preheated almost to the softening point.

Low-temperature distillation produces less gas (except in internally heated retorts), more coke or semi-coke, more tar of lighter specific gravity, and less ammonium sulphate than high temperature distillation. High and low temperature tars differ greatly. High-temperature tar contains large percentages of benzine, toluene, xylene, and naphthalene compounds which are used in making dyes and explosives. It also produces pitch which is used in roofing and road making. Low-temperature tars lack these compounds and the proportion of pitch is much reduced. It is high in phenols but in general its use is mainly for fuel, so that the primary by-products from low-temperature distillation probably do not have any greater value than those obtained by high-temperature distillation. The main advantage is in the value of the semi-coke as a smokeless fuel for household use. A ton of coal produces 200 pounds more low temperature coke than high temperature coke.

Oil from coal. Approximately 40 million tons of Pennsylvania coal are used each year for making high-temperature coke, 55 million tons are exported, and the rest, 75 million tons, is burned in Pennsylvania. Suppose that 50 million tons of this coal was subjected to low-temperature distillation. The result would be 38 to 40 million tons of household, smokeess fuel, 250 million gallons of light oil suitable for automobiles, 250 million gallons of creosoting and disinfecting oils, 500 million gallons of fuel oil, and 75 to 100 billion cubic feet of rich gas. If all of the 40 million tons of coal now

coked at a high temperature were coked in by-product ovens, it would yield 28 million tons of metallurgical coke, 80 million gallons of light oil, 400 thousand tons of ammonium sulphate, and 320 million gallons of tar and pitch. The total production of motor fuel would be 330 million gallons in addition to the gas and heavy oil. At 20 miles to the gallon that quantity would run 1 million automobiles 6,600 miles each.

In recent years many studies have been carried on with the idea of converting still more of the coal into oil. This has been especially true in European countries which have little or no domestic supply of petroleum and in time of war might be quite shut off from that most necessary fuel. Some of these studies have succeeded so far that commercial plants have been or are being built for the manufacture of oil from coal.

Space permits the description of only two of these processes. In one, hydrogen is combined with carbon and oxygen at very high temperature and pressure. In the other hydrogen combines with carbon monoxide at moderately low temperature in the presence of catalysts. In the Bergius process, developed by Dr. Friederich Bergius of Heidelberg, Germany, the coal is first finely ground and then mixed with heavy oil into a thick pasty mass. This mass is then heated in a steel retort to a temperature of 800° F. under 3,000 pounds pressure per square inch. At the same time hydrogen obtained by the action of steam on methane (one of the products of the process), is introduced into the retort and the mass is stirred. The mass passes from the first retort to a second retort where the further addition of hydrogen completes the process and the whole mass is then withdrawn and separated into oils, gas, and so forth. The temperature of the oven is controlled by an inert gas (CO_2 or N) which is heated by the emerging products. That in turn is used to heat the retorts where the combination of the hydrogen, carbon, and oxygen takes place. A ton of coal produces 300 pounds of gasoline, 400 pounds of diesel or creosote oil, 120 pounds of lubricating oils, and 160 pounds of fuel oil. Some of the heavy oil is returned to the first tank and used in the process. Carbolic acid is one of the products of the process. The volume of gas given off is very large. The process has been developed as the result of 15 years study and at a cost of several million dollars. The following chart prepared by Dr. Bergius shows the percentage of products obtained by this process as compared with those obtained by the high temperature and low temperature carbonization of coal.

The Bergius process is well adapted to use with lower rank coals such as lignites, 90 per cent of which can be converted into merchantable products. Two German plants employing 150 men are now engaged in producing oil by this process.

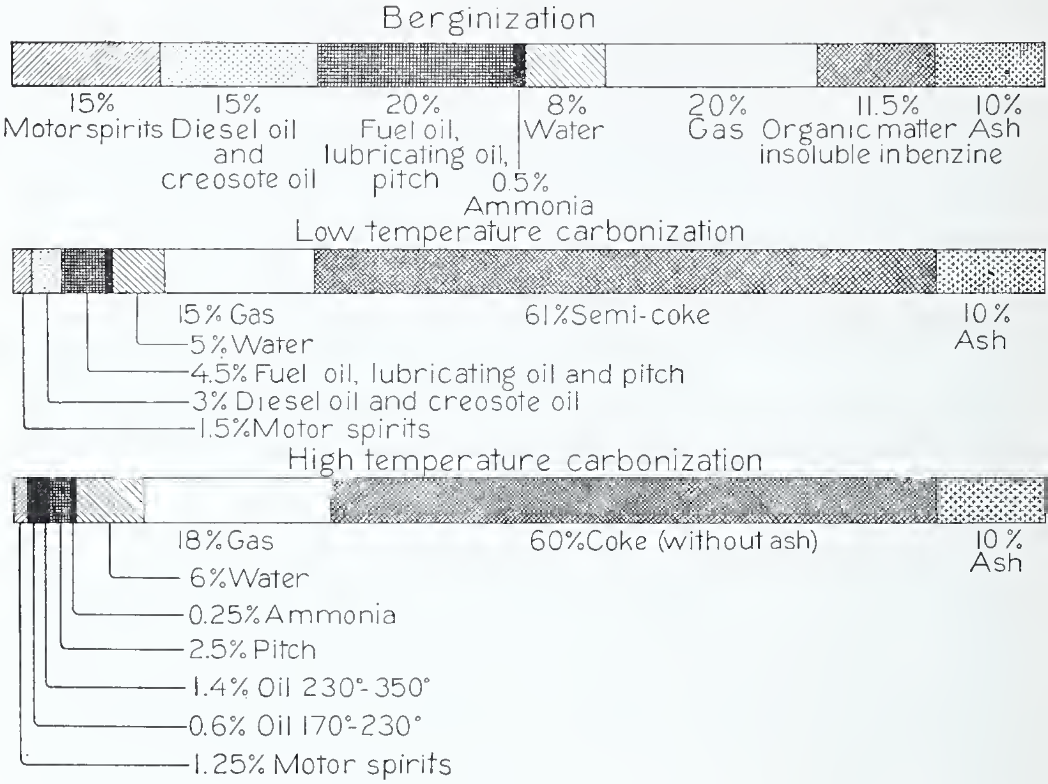


Fig. 29. Chart of oil from coal.

In the other process which is the invention of Dr. Franz Fischer of Mulheim, Germany, purified water gas (waste blast furnace gas may be used) is mixed with hydrogen and passed over finely divided iron or cobalt which, at a temperature of 450° F., acts as a catalyst and leads to the combination of the gases into an oil which Fischer calls "synthol." This oil consists of alcohols, ketones, and aldehydes. It differs from natural petroleum in that it contains oxygen which is absent in the natural products.

It is evident that before our supplies of oil are exhausted, whether from wells or from oil shales, a practical way of turning coal into oil will certainly be found.

Other uses of coal. During the last few years two experiments in France and Germany have shown that methyl alcohol, or wood alcohol can be made from coal and water. The process consists of converting the coal into water gas, and then adding more hydrogen. The mixture is passed over metallic oxides at a certain pressure and temperature; the oxide acts as a catalyst and one or more of the alcohols is produced. A ton of bituminous coal will produce at least 800 pounds of methyl alcohol or 480 pounds of butyl alcohol. These alcohols are now generally made by the fermentation of corn. Butyl alcohol is used as a solvent for cellulose lacquers. By varying the process, other products can be made such as acetone, formalin, various acids and ethers used as disinfectants; products for mak-

ing artificial leather, synthetic resins, such as bakelite, and a hundred other things from wintergreen to fruit flavors. Synthetic rubber is among the possibilities of these new processes.

Fertilizer from coal. Somewhat similar processes are being used to produce fertilizer. Hydrogen from coal or coke and nitrogen are brought together under great pressure in the presence of a catalyst. Ammonia is formed. The Haber process was used in Germany during the war for the production of nitrogen for explosives, and it is claimed that today this process is being used to produce 80 per cent of the fixed nitrogen needed in the industries and for fertilizer, and is likely to make the use of water power for fixing nitrogen obsolete except where water power is abundant.

In several recently invented processes coke is employed in making acid or ammonium phosphates in the electric furnace. These products can also be made from coal in a reverberatory furnace.

Distillation products of coal. The first step in distillation of coal breaks it up into coke, gas, ammonia and tar. Ammonium sulphate, sal-ammonium, and other substances come from the ammonia.

The coal tar redistils into light oil, middle oil, heavy oil, and pitch. The light oil is broken up into groups of compounds, some of which contain great numbers of different substances. One includes xylol and saccharine; another includes toluol in its various forms; others are a naptha group, a benzol group, a group containing TNT and other explosives; a group known as the aniline dyes, and groups which include perfumes, essences, extracts, colognes, and cold creams.

The middle oil is broken up into a naphthalene group including moth balls, into cresol and flotation oil, into picric and carbolic acid, into disinfectants and antiseptics of many kinds; headache medicine, phitalic acid, into azo dyes, permissible food dyes, inks, lantern slide colors, photographic developers, and so forth.

Two series come from the heavy oil; anthracene series, including the alizanine dyes, and the creosote oils from which shingle stains and wood preservatives are made.

Roofing pitch, tarvia for roads, asphalt, varnish, paints for metals, slag cement, and materials of that kind are derived from the pitch.

PRODUCTION AND USES.

Production of bituminous coal in Pennsylvania, 1840-1925, in short tons[1]

Year	Production	Percentage of United States production	Value
1840	464,826	22.5	$
1841	475,000	20.7	
1842	500,000	19.2	
1843	650,000	21.2	
1844	675,000	18.3	
1845	700,000	16.3	
1846	760,000	15.7	
1847	399,840	7.6	
1848	500,000	8.7	
1849	750,000	11.6	
1850	1,000,000	14.3	5,268,351
1851	1,200,000	13.7	
1852	1,400,000	14.3	
1853	1,500,000	14.3	
1854	1,650,000	13.8	
1855	1.780,000	13.8	
1856	1,850,000	13.7	
1857	2,000,000	15.0	
1858	2,200,000	15.8	
1859	2,400,000	15.4	
1860	2,690,786	18.4	14,746,153
1861	3,200,000	19.5	
1862	4,000,000	22.9	
1863	5,000,000	23.5	
1864	5,839,000	24.7	
1865	6,350,000	26.8	
1866	6,800,000	23.4	
1867	7,300,000	23.8	
1868	7,500,000	22.9	
1869	6,750,000	20.5	
1870	7,798,518	23.6	13,921,069
1871	9,040,565	19.3	
1872	11,695,040	22.7	
1873	13,098,829	23.0	
1874	12,320,000	23.7	
1875	11,760,000	22.6	
1876	12,880,000	24.3	
1877	14,000,000	23.3	
1878	15,120,000	26.5	
1879	16,240,000	23.9	
1880	18,425,163	25.9	18,567,129
1881	22,400,000	26.3	
1882	24,640,000	23.9	
1883	26,880,000	23.4	
1884	15,084,941	23.3	
1885	20,647,720	23.4	
1886	27,094,501	24.0	21,016,235
1887	31,516,856	24.2	27,806,941
1888	33,796,727	22.8	32,106,891
1889	36,174,089	25.6	27,953,315
1890	42,302,173	26.9	35,376,916
1891	42,788,490	25.5	37,271,053
1892	46,694,576	26.1	39,017,164
1893	44,070,724	24.2	35,260,674
1894	39,912,463	23.5	29,479,820
1895	50,217,228	26.0	35,980,357
1896	49,557,453	25.9	35,368,249
1897	54,417,974	27.2	37,636,347
1898	65,165,133	29.7	43,352,588
1899	74,150,175	29.3	56,247,791
1900	79,842,326	29.7	77,438,545
1901	82,305,946	28.1	81,397,586
1902	98,574,367	32.7	106.032,460
1903	103,117,178	28.9	121,752,759
1904	97,938,287	27.9	94,428,219
1905	118,413,637	30.2	113,390,507
1906	129,293,206	31.2	130,290,651
1907	150,143,177	31.2	155,664,026
1908	117,179,527	28.1	118,816,303

[1] Compiled by Mrs. Anna C. Bock, principally from Mineral Resources of United States Geological Survey.

Production of bituminous coal in Pennsylvania, 1840-1925, in short tons

Year	Production	Percentage of United States production	Value
1909	137,966,791	29.9	130,085,237
1910	150,521,526	30.0	153,029,510
1911	144,561,257	29.2	146,154,952
1912	161,865,488	30.3	169,370,497
1913	173,781,217	30.5	193,039,806
1914	147,983,294	28.8	159,006,296
1915	157,955,137	29.7	167,419,705
1916	170,295,424	28.9	221,685,175
1917	172,448,142	26.5	421,268,808
1918	178,550,741	26.3	463,159,736
1919	150,758,154	27.2	365,430,504
1920	170,607,847	25.9	642,630,000
1921	116,013,942	22.9	322,538,300
1922	113,148,308	23.7	351,777,000
1923	171,879,913	26.1	472,217,000
1924	130,633,773	22.9	295,164,000
1925	136,928,019	26.3	----------
1926	151,119,000	----------	----------

Production of bituminous coal in Pennsylvania, by counties, in short tons, 1884-1923.

Year	Allegheny	Armstrong	Beaver	Bedford	Blair	Bradford
1884	2,863,631	170,826	156,695	69,770	208,541	313,575
1885	3,588,244	139,327	184,631	107,694	205,075	249,920
1886	4,202,086	210,856	208,820	173,372	305,695	206,998
1887	4,680,924	235,221	197,863	311,452	287,367	167,416
1888	5,575,505	226,093	63,900	248,159	314,013	163,851
1889	4,717,431	289,218	93,461	257,455	215,410	129,141
1890	4,894,372	380,554	139,117	445,192	298,196	126,687
1891	5,640,669	484,000	129,961	389,257	237,626	68,697
1892	6,399,199	583,519	140,835	552,461	259,224	57,708
1893	6,663,095	561,039	150,095	501,507	177,902	42,739
1894	6,354,559	580,030	103,765	313,095	256,157	28,027
1895	6,615,974	642,809	184,096	417,988	374,157	52,711
1896	7,856,867	614,932	127,290	237,414	360,987	53,519
1897	7,216,039	857,637	99,546	436,619	492,975	41,588
1899	9,972,060	1,054,389	258,466	493,965	407,356	31,835
1898	8,889,997	818,404	223,855	456,507	404,043	22,508
1900	10,051,905	1,313,188	262,398	570,055	496,992	32,065
1901	10,307,100	1,555,255	176,012	500,322	368,779	22,189
1902	11,919,569	1,793,179	225,162	797,248	338,204	----------
1903	12,689,225	1,920,584	180,102	926,334	309,736	----------
1904	12,291,261	1,996,661	67,923	540,850	244,932	----------
1905	13,662,610	2,497,314	82,676	752,715	348,749	----------
1906	16,823,027	2,574,758	81,531	734,855	402,438	----------
1907	18,315,736	3,430,002	109,575	967,313	493,219	(a)
1908	14,083,843	2,777,486	222,711	511,014	315,167	(a)
1909	16,087,010	2,787,508	224,450	435,129	410,161	(a)
1910	18,835,336	3,304,915	228,226	716,833	380,870	(a)
1911	17,863,795	3,799,227	203,556	528,170	294,048	(a)
1912	18,867,265	4,104,989	247,465	731,477	324,336	----------
1913	20,117,823	5,321,622	248,585	850,792	391,717	----------
1915	17,417,815	5,159,882	87,891	635,791	308,541	50,904b
1916	17,007,431	5,430,188	91,553	721,587	435,792	39,005b
1917	17,836,377	5,574,861	129,163	947,053	271,598	47,151b
1918	17,375,035	6,051,753	128,572	1,050,528	279,817	31,299b
1914	16,808,202	4,579,389	101,809	634,219	308,945	36,374b
1919	14,856,781	4,665,232	139,294	704,289	181,209	13,373b
1920	16,047,575	5,975,063	170,900	785,903	158,257	67,932c
1921	11,931,527	3,388,762	161,409	317,244	92,144	55,296b
1922	11,023,211	3,265,848	226,959	340,434	98,206	7,904
1923	20,224,239	5,061,732	247,071	597,496	169,276	10,330

a. Included in Small Mines.
b. Includes Lycoming County.
c. Includes Fulton and Lycoming counties.
d. Includes Fulton, Lycoming and McKean counties.

Production of bituminous coal in Pennsylvania, by counties, in short tons, 1884-1923.

Year	Butler	Cambria	Cameron	Centre	Clarion	Clearfield
1884	151,335	659,843	13,652	216,422	329,973	2,177,513
1885	85,429	1,037,000	7,706	373,504	299,216	3,368,671
1886	162,306	1,222,028	3,200	313,383	429,544	3,753,956
1887	161,764	1,421,980	3,000	508,255	593,758	5,180,311
1888	194,715	1,540,460	700	382,770	535,192	5,398,981
1889	288,591	1,751,664	2,300	395,127	596,58[illegible]	5,224,506
1890	167,578	2,790,954	-----	452,114	512,387	6,651,587
1891	211,647	2,932,973	-----	526,753	479,887	7,143,382
1892	145,729	3,086,554	-----	496,521	569,333	6,876,785
1893	156,016	3,282,467	-----	458,056	551,158	6,148,758
1894	137,593	2,978,927	-----	307,806	401,004	4,148,464
1895	233,104	4,289,257	-----	273,647	389,850	5,215,527
1896	230,336	4,649,819	-----	251,665	371,749	4,812,017
1897	233,689	5,416,950	-----	521,100	247,839	5,479,047
1898	161,312	6,740,461	-----	714,175	278,131	6,055,739
1899	214,899	7,208,834	-----	912,648	289,753	6,251,442
1900	221,704	8,190,366	-----	932,265	404,639	6,620,834
1901	269,161	9,045,201	-----	839,512	354,840	5,886,407
1902	454,166	10,561,835	-----	1,000,598	458,221	7,334,785
1903	649,033	10,942,496	(a)	759,458	531,630	7,462,682
1904	497,316	10,845,560	(a)	712,036	551,532	5,746,870
1905	550,589	12,600,891	(a)	810,441	714,478	7,248,305
1906	803,499	12,439,152	(a)	895,434	719,548	5,944,745
1907	902,729	16,361,880	(a)	1,256,383	1,078,367	8,034,711
1908	802,462	14,138,308	-----	1,086,384	972,785	6,247,534
1909	828,043	15,545,185	(a)	1,239,049	941,059	7,573,322
1910	1,017,809	16,629,461	(a)	1,293,622	1,156,697	8,463,910
1911	957,074	16,928,628	(a)	1,140,263	1,057,390	7,852,426
1912	1,000,947	17,585,130	46,617b	1,291,374	1,199,322	7,938,337
1913	1,080,002	19,621,378	48,942b	1,497,271	1,427,848	8,278,015
1914	981,704	18,034,487	40,538b	1,264,075	1,341,392	7,149,023
1915	1,036,877	18,716,451	47,011b	1,430,749	1,291,119	8,022,894
1916	1,180,008	19,588,350	28,859b	1,819,007	1,368,544	8,876,823
1917	1,201,963	19,730,770	12,165b	1,999,407	1,380,494	9,336,533
1918	1,397,927	20,569,253	7,483b	1,984,664	1,607,641	9,376,429
1919	1,128,192	16,899,818	-----	1,296,061	1,393,647	7,573,392
1920	1,542,307	18,967,754	-----	1,735,045	1,567,095	9,242,416
1921	923,391	16,339,228	-----	764,994	1,248,294	5,853,922
1922	1,837,961	12,957,315	50,682c	1,207,859	1,320,469	5,456,359
1923	1,856,319	19,751,465	83,625c	1,356,503	1,900,549	7,546,058

a. Included in Small mines.
b. Includes McKean county.
c. Includes Fulton, Lycoming and McKean counties.

Production of bituminous coal in Pennsylvania, by counties, in short tons, 1884-1923.

Year	Clinton	Elk	Fayette	Fulton	Greene	Huntingdon
1884	-----	413,243	4,041,643	-----	-----	212,527
1885	-----	537,826	3,192,972	-----	8,248	247,424
1886	-----	526,036	4,494,613	-----	5,600	313,581
1887	-----	609,757	4,540,322	-----	3,002	265,479
1888	32,000	555,960	5,208,993	-----	5,323	281,823
1889	106,000	614,113	5,897,254	-----	53,714	280,133
1890	159,000	1,121,534	6,413,081	-----	-----	322,630
1891	130,802	973,600	5,782,573	-----	-----	269,021
1892	98,242	731,575	7,260,044	-----	-----	333,855
1893	94,582	634,165	6,261,146	-----	-----	303,547
1894	100,000	399,023	6,440,989	-----	-----	200,032
1895	95,291	642,143	9,665,369	-----	-----	327,770
1896	134,569	807,886	8,076,200	-----	-----	339,597
1897	157,333	969,503	9,701,691	-----	-----	303,939
1898	166,250	873,485	12,696,063	-----	-----	312,607
1899	221,574	1,221,979	14,609,289	-----	-----	357,812
1900	288,881	926,403	15,055,242	-----	-----	368,942
1901	306,228	1,007,314	16,187,224	-----	-----	374,529

Production of bituminous coal in Pennsylvania, by counties, in short tons, 1884-1923.

Year	Clinton	Elk	Fayette	Fulton	Greene	Huntingdon
1902	365,732	756,182	18,988,058	------------	25,550	460,485
1903	403,543	1,339,281	19,613,161	------------	153,000	500,647
1904	341,967	1,129,231	19,231,011	------------	80,646	487,223
1905	296,988	1,249,337	24,250,989	------------	105,000	559,039
1906	233,674	944,367	27,044,451	------------	144,251	630,155
1907	322,624	1,427,841	29,260,622	------------	158,187	721,604
1908	253,958	1,147,209	19,474,417	------------	145,644	598,094
1909	272,184	1,150,675	28,866,229	------------	137,448	502,823
1910	310,973	1,202,323	31,097,233	------------	77,321	669,226
1911	314,643	1,223,856	26,610,162	------------	31,743	806,199
1912	345,454	1,146,496	32,366,567	------------	35,839	834,914
1913	343,054	1,201,065	32,607,963	------------	316,752	935,774
1914	326,545	963,238	23,336,180	------------	290,497	851,128
1915	359,275	1,045,554	28,424,067	------------	546,008	1,010,750
1916	422,062	937,583	34,249,848	------------	744,860	962,332
1917	401,812	907,187	32,083,027	------------	900,378	1,155,602
1918	360,123	968,868	32,925,888	------------	1,269,425	1,371,562
1919	288,100	947,595	29,660,105	273,783a	1,423,118	833,690
1920	327,296	1,258,834	30,742,236	(b)	2,078,835	839,613
1921	83,641	878,201	19,260,778	(b)	2,294,801	484,008
1922	146,150	855,105	17,759,776	------------	2,348,527	397,150
1923	260,551	1,147,125	32,165,961	(c)	3,982,003	757,678

a. Includes McKean county.
b. Included in Bradford county.
c. Included in Cameron county.

Production of bituminous coal in Pennsylvania, by counties, in short tons, 1884-1923.

Year	Indiana	Jefferson	Lawrence	Lycoming	McKean	Mercer
1884	30,758	450,079	42,818	------------	78,870	276,350
1885	82,750	479,675	42,137	------------	44,312	378,508
1886	103,615	1,023,186	101,154	------------	617	537,712
1887	207,597	1,693,492	125,361	------------	9,214	539,721
1888	157,285	2,275,349	106,921	------------	10,443	487,122
1889	153,698	2,896,487	143,410	------------	11,500	575,751
1890	357,580	2,850,799	140,528	------------	15,000	524,319
1891	456,077	3,160,614	164,669	------------	15,345	526,210
1892	514,463	3,706,329	216,561	20,515	21,282	420,145
1893	380,666	3,885,196	196,736	53,192	19,169	499,651
1894	398,548	3,248,154	132,422	80,160	19,844	331,594
1895	513,075	4,248,329	269,779	84,050	38,000	535,042
1896	418,642	4,508,077	198,666	83,230	33,133	579,069
1897	541,967	4,697,059	195,286	91,735	31,527	435,772
1898	563,791	5,625,168	185,408	98,118	25,622	316,669
1899	616,911	5,841,960	183,555	101,923	23,703	486,724
1900	924,782	6,199,290	187,810	99,000	20,214	528,070
1901	1,074,260	5,806,568	171,959	107,095	------------	577,338
1902	1,655,281	6,083,494	212,445	112,820	------------	628,713
1903	2,043,140	6,474,764	232,992	57,030	------------	704,747
1904	2,683,951	6,043,564	182,662	78,837	------------	619,648
1905	4,477,431	6,393,985	267,470	33,844	------------	707,964
1906	4,657,457	5,160,195	257,716	44,425	------------	842,648
1907	7,635,998	5,964,397	220,718	51,956	(b)	955,290
1908	6,843,179	4,853,313	142,639	34,626	------------	724,158
1909	7,681,205	4,934,907	156,749	28,016	------------	893,880
1910	8,954,366	5,668,883	95,102	25,725	------------	867,754
1911	8,780,983	5,550,816	90,151	13,271	(b)	859,355
1812	9,174,927	5,416,536	75,823	7,777	(d)	846,228
1913	10,204,684	5,801,864	94,283	26,953c	(d)	777,601
1914	9,422,996	5,089,623	123,987	27,795c	(d)	716,995
1915	9,553,857	4,895,409	131,746g	(c)	(d)	694,411
1916	11,022,780	5,764,525	614,994a	(c)	(d)	(f)
1917	12,053,766	5,551,658	132,929	(c)	(d)	527,421
1918	12,743,190	5,140,833	107,086	(c)	(d)	690,785
1919	8,526,404	3,841,478	140,054	(c)	(e)	481,521
1920	11,414,048	5,346,458	157,934	(c)	------------	530,427
1921	6,357,971	2,707,894	193,657	(c)	(c)	479,887
1922	7,620,831	2,900,435	208,907	------------	------------	457,453
1923	10,475,299	4,381,693	281,708	(d)	(d)	465,349

a. Includes Mercer and Fulton counties.
b. Included in Small mines.
c. Included in Bradford county.
d. Included in Cameron county.
e. Included in Fulton county.
f. Included in Lawrence county.
g. Includes Fulton county.

Production of bituminous coal in Pennsylvania, by counties, in short tons, 1884-1923.

Year	Somerset	Tioga	Venango	Washington	West-moreland	Small Mines
1884	269,930	931,922	15,000	707,262	3,282,733	
1885	302,715	1,067,081	7,000	836,633	3,774,072	
1886	349,926	1,384,800	2,500	1,612,407	5,446,480	
1887	416,240	1,328,963	2,296	1,751,615	6,074,486	200,000
1888	370,228	1,106,146	2,000	1,793,022	6,519,773	240,000
1889	442,027	1,036,175	6,911	2,364,901	7,631,124	
1890	522,796	903,997		2,836,667	8,290,504	985,000
1891	480,194	1,010,872		2,606,158	7,967,493	1,000,000
1892	509,610	999,784		2,903,235	8,791,068	1,000,000
1893	532,688	962,248		3,315,146	7,439,760	800,000
1894	418,195	704,560		3,461,428	7,767,964	600,123a
1895	524,755	801,091		3,577,260	9,606,154	600,000
1896	787,050	825,687		4,039,976	8,559,076	600,000
1897	924,607	938,053		3,802,661	9,923,812	600,000
1898	1,846,398	921,760		4,753,673	11,414,989	600,000
1899	2,950,343	670,126		4,987,360	14,181,269	600,000
1900	4,779,307	931,301		4,856,188	14,980,535	600,000
1901	4,831,660	861,072		5,910,621	15,165,300	600,000
1902	5,911,326	1,149,849		8,529,954	18,811,511	
1903	5,957,751	905,688		9,216,267	19,127,904	15,983b
1904	5,317,161	616,828		8,900,254	18,688,974	41,389b
1905	6,412,672	706,723		10,609,051	22,998,726	75,650b
1906	6,674,191	826,925		12,714,405	27,573,420	125,939b
1907	7,769,708	1,146,353		14,535,727	28,916,721	105,516e
1908	7,401,945	682,099		12,118,007	21,499,292	100,253b
1909	7,902,338	785,922		12,982,179	25,432,320	169,000e
1910	8,837,682	1,037,417		16,638,677	22,885,404	125,761e
1911	9,177,421	830,330		15,343,772	24,102,195	201,783c
1912	9,888,144	997,787		16,645,127	30,589,549	157,061f
1913	9,928,776	943,748		18,309,317	33,258,702	173,639g
1914	10,238,763	679,221		15,495,674	28,995,427	172,863
1915	10,343,369	788,003		15,898,719	29,892,561	165,483
1916	9,340,568	829,561		18,119,353	30,499,703	200,108
1917	9,454,537	866,803		21,513,603	28,027,782	404,102f
1918	10,264,083	834,385		23,537,263	28,121,234	355,615f
1919	10,433,752	593,637		19,515,856	24,947,773	
1920	10,532,967	763,611		23,321,195	24,510,146	2,524,000
1921	8,975,809	437,702		14,716,984	18,066,398	
1922	7,628,253	374,154		12,572,477	20,639,693	1,446,190
1923	8,530,618	480,335		24,499,103	25,408,870	238,957

a. Includes Forest county.
b. Includes Cameron county.
c. Includes Bradford, Cameron and McKean counties.
d. Includes Bradford county.
e. Includes Bradford and Cameron counties.
f. Includes Fulton county.
g. Includes Lycoming county.
h. Includes Cameron, Fulton and McKean.

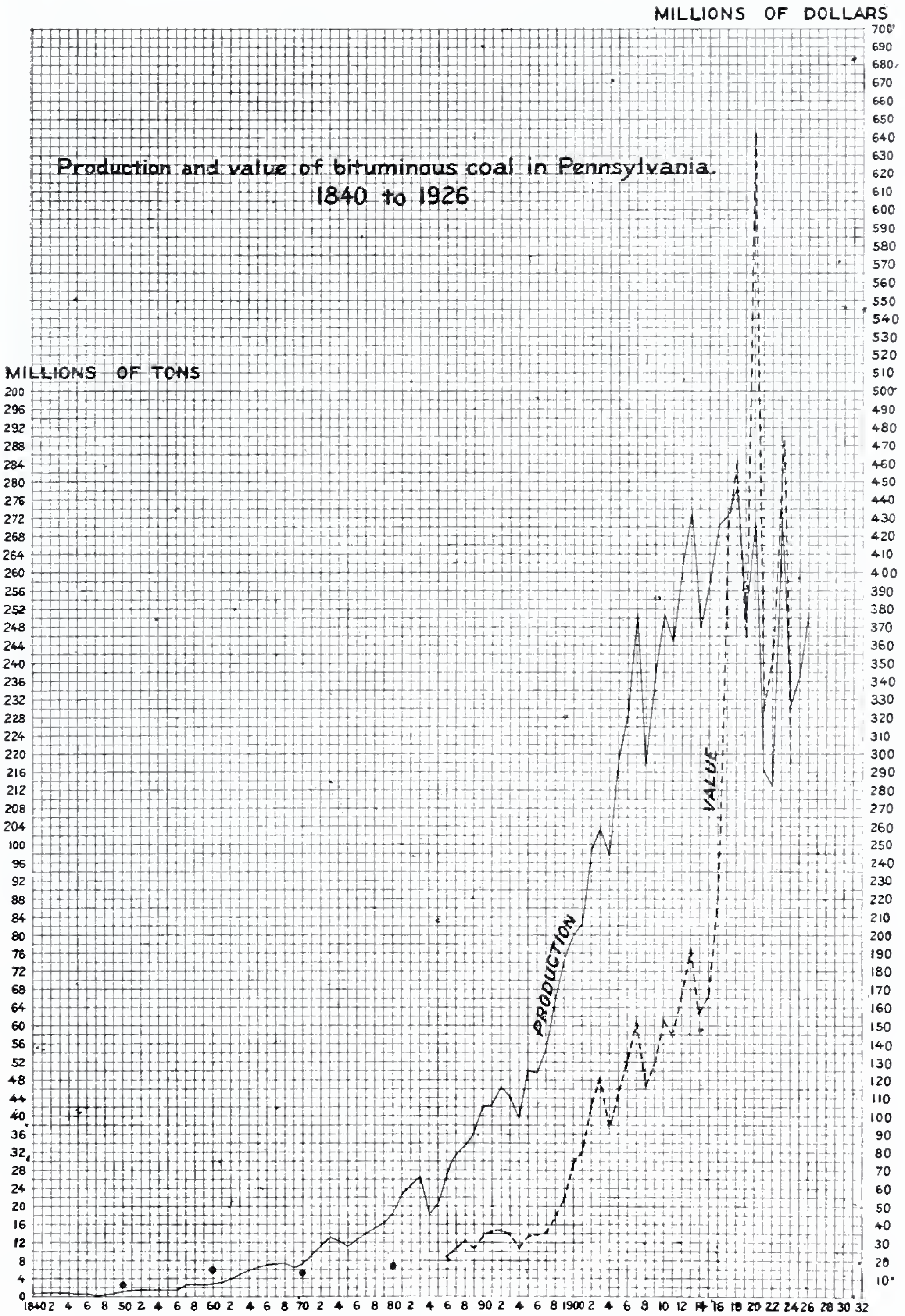
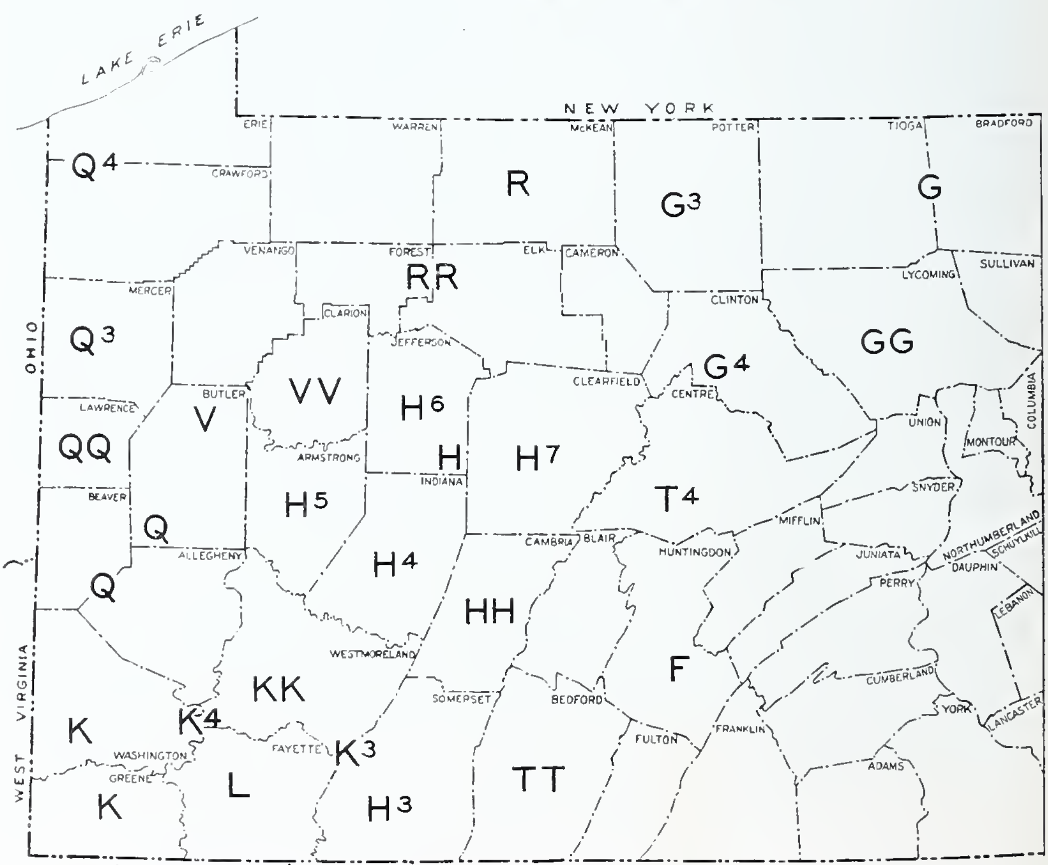


Fig. 30. Production and value of Pennsylvania coal.

The following table gives, in a general way, the distribution and uses of Pennsylvania coal. The distribution of tonnages assumed is made on a yearly production of 170 million tons of bituminous coal and 90 million tons of anthracite. Figures for a definite year are not available.

Use of Pennsylvania coal

	Anthracite (short tons)		Bituminous	
	Items	Totals	Items	Totals
Used at mines		9,500,000		5,500,000
Coke making				40,000,000
Bunker fuel				7,000,000
Foreign trade (including Canada)		5,000,000		8,000,000
Coal gas		150,000		200,000
Power		20,350,000		37,300,000
Railroads			10,300,000	
Electric roads			500,000	
Electric utilities			4,000,000	
Blast furnaces			1,000,000	
Rolling mills			12,500,000	
Foundries, etc.			600,000	
Industrial			8,400,000	
Domestic use in Pennsylvania (and misc.)		8,500,000		25,000,000
(pea and used locally)		9,300,000		
Shipped to other States (anthracite "domestic" only)		37,200,000		47,000,000
To New England	9,200,000			
To New York	16,000,000			
To other States	12,000,000			
		90,000,000		170,000,000



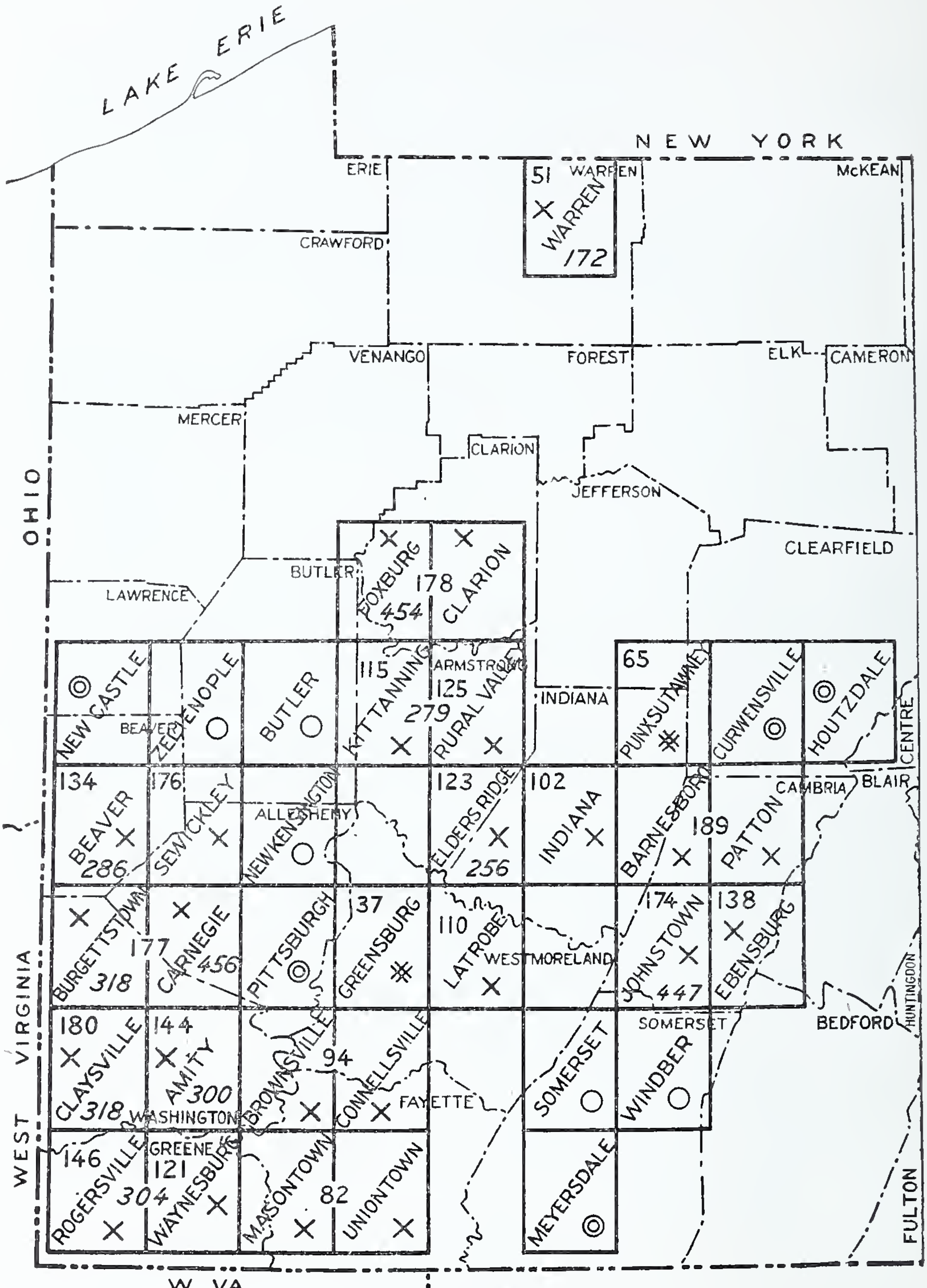
Fif. 31. Key map of Second Geological Survey reports.

BIBLIOGRAPHY OF COAL REPORTS

Pennsylvania Second Geological Survey*

Allegheny County, Annual Report 1886; part 1; eastern part, map, volume K2, northern part, vol. Q. southern part, vol. K
Analyses of coals, volumes M, M2, M3
Anthracite region, general map: AA Atlas, Southern Coal field, part 1; Annual Report 1886, part 3; Atlas.
Reports: Vol. AA, part 1; part 2; Annual Report 1885; Annual Report 1886, part 3 and Atlas; Summary Final Report, vol. III, part I.
Anthracite maps, Atlas AA, Northern coal field, parts 1 to 6; Eastern Middle, parts 1 to 3; Western Middle, parts 1 to 3; Southern, parts 1 to 6.
Anthracite, methods of mining and appliances, vol. AC and Atlas
Anthracite, rocks below coal, vol. Q7
Antrim coal field, vol. G
Armstrong County with map, vol. H5
Arnot coal field, Vol. G
Barclay coal field, vol. G
Beaver County with map, vol. Q
Bedford County, vol. T2
Bernice coal basin, Annual Report 1885
Bituminous coal field, geology of, Summary Final Report vol. III, pt. 2
Blair County, vol. H2; (Topton Run coals, Annual Report 1885)
Blossburg coal field, vol. G
Bradford County, vol. G
Broad Top coal field, vol. T2; in Huntingdon Co., vol. T3; Final Summary Report, Vol. III, part 2.
Butler County, south part, vol. Q; north part, vol. V
Cameron County, vol. RR
Cambria County and maps, Atlas, H2 and H3
Centre County with map; vol. T4
Clarion County with map, vol. V2; Vol. R2 Atlas
Clearfield County, vols. H and H7
Clinton County, vol. G4
Coke manufacture, vols. G, G2, L
Elk County, vol. RR and Atlas
Fayette County, vols. K2 and K3
Forest County, vol. RR and Atlas
Gaines coal field, Vol. G
Greene County, vol. K and Annual Report 1886
Huntingdon County, vol. 1, vol. T3
Indiana County, vol. H4
Jefferson County, vols. H and H6
Lackawanna County, vol. G7
Lawrence County, vol. G2
Ligonier Valley coal field, vols. V2, K3
Lycoming County, vol. G2
Luzerne County, vol. G7
McKean County, vol. R2 and Atlas

*These publications are out of print and can be consulted at the larger libraries throughout the State. Second-hand bookstores have some of the volumes.



EXPLANATION

× U.S.G.S. Publications { Folios 178, *Bulletins 286* }

○ { U.S.G.S. Field work completed, publications not yet issued. }

⋇ Pa.G.S. Publications 37

◎ { Pa.G.S Field work completed, publications not yet issued. }

Fig. 32. Key map of Fourth Geological Survey and of U. S. Geological Survey publications.

Mercer County, vol. Q3
Mining Methods, Pittsburgh region, Annual Report 1886, part 1
Monongahela River mines; description of, vol. K4
Pittsburgh coal regions, re-survey Annual Report 1885, Annual Report 1886, Part 1
Potter County, vol. G3
Snow Shoe coal basin, vol. T4
Somerset County, vol. H3
Southwest Pennsylvania map, Annual Report 1886, part 1
Sullivan County, vol. G2
Tioga County, vol. G
Washington County, vol. K
Wellersburg basin, Annual Report, 1885
Westmoreland County, vols. K2 and K3. Annual Report 1886, part 1
Youghiogheny River mines, vols. K4 and L

The Third or "Commission" Survey

Report for 1906-1908; Progress of Cooperative Geological Survey
Report 10; The Broad Top Coal Field, with case of maps.

The principal work of the Third Survey on coal was done in cooperation with the U. S. Geological Survey; mapping was done by quadrangles rather than by counties and the reports were published by the U. S. Geological Survey in the form of folios and bulletins. All are out of print except those for which prices are given.

United States Geological Survey

FOLIOS[1]

Quadrangles	No.	Price	Quandrangles	No.
Amity	144		Johnstown	174
Barnesboro-Patton	189	25¢	Kittanning	115
Beaver	134		Latrobe	110
Brownsville-Connellsville	94		Masontown-Uniontown	82
Burgettstown-Carnegie	177		Mercersburg-Chambersburg	170
Claysville	180	5¢	Philadelphia	162
Ebensburg	133		Rogersville	146
Elders Ridge	123		Rural Valley	125
Elkland-Tioga	93		Sewickley	176
Foxburg-Clarion	178		Trenton	167
Gaines	92	5¢	Warren	172
Indiana	102		Waynesburg	121

BULLETINS[2]	No.	Price
Amity	300	.30
Barnesboro-Patton	531	....
Beaver	286	.35
Elders Ridge	256	....
Foxburg-Clarion	454	.30
Johnstown	447	1.40
Rogersville	304	.45
Rural Valley	279	.50
Kittanning	....	....
Waynesburg	304	....

[1]Obtain from U. S. Geological Survey, Washington, D. C.
[2]Obtain from Superintendent of Documents, Washington, D. C.

The State Survey, pending the completion of the introductory volume on bituminous coal fields, issued a series of mimeographed bulletins dealing with the coal beds and coal reserves of Pennsylvania by counties. This list follows. The numbers dealing with coal beds were withdrawn from circulation as soon as Part II of this volume was issued, and the bulletins dealing with the coal reserves will be withdrawn as soon as Part III of this volume is issued.

Pennsylvania Topographic and Geologic Survey
(4th Survey—Mimeographed Bulletins)

14. Future sources of power—by G. H. Ashley—3 pages
15. Mineral resources of Pennsylvania—by G. H. Ashley—12 pages
18. Oil from Pennsylvania shales and coals, by Chas. R. Fettke, 15 pp
23. Coal beds in Cambria County, Penna.—by J. D. Sisler—13 pp.
24. Coal beds in Greene County, Penna.—by J. D. Sisler—6 pages
25. Coal reserves in Greene County, Penna.—by J. F. Reese—6 pages
26. Coal beds in Washington County, Penna.—by J. D. Sisler—8 pp.
27. Coal reserves in Washington County, Penna.—by J. F. Reese, 6 pp.
30. Coal beds in Allegheny County, Penna.—by J. D. Sisler—9 pages
31. Coal reserves in Allegheny County, Penna.—by J. F. Reese—5 pp.
32. Coal beds in Fayette County, Penna.—by J. D. Sisler—13 pp.
33. Coal reserves in Fayette County, Penna.—by J. F. Reese—5 pages
34. Coal beds in Westmoreland County, Penna.—by J. D. Sisler—15 pp.
35. Coal reserves in Westmoreland County, Penna.—by J. F. Reese, 5 p.
36. Coal beds in Indiana County, Penna.—by J. D. Sisler—11 pages
37. Coal reserves in Indiana County, Penna.—by J. F. Reese—5 pages
38. Coal beds in Armstrong County, Penna.—by J. D. Sisler—12 pages
39. Coal reserves in Armstrong County, Pa.—by J. F. Reese—5 pages
41. Coal beds in Elk County, Penna.—by J. D. Sisler—5 pages
42. Coal beds in Jefferson County, Penna.—by J. D. Sisler, 10 pages
43. Coal reserves in Somerset County, Penna.—by J. F. Reese, 12 pp.
44. Coal reserves in Cambria County, Penna.—by J. F. Reese, 5 pages
46. Coal beds in Butler County, Penna.—by J. D. Sisler—5 pages
49. Coal beds in Clarion County, Penna.—by J. D. Sisler—7 pages
50. Coal beds in Centre, Cameron, Clinton, and Lycoming counties, Penna.—by J. D. Sisler—8 pages
52. Coal beds in Mercer, Crawford, Venango, Forest, Warren, McKean, Potter, Tioga, and Bradford counties, Penna.—by J. D. Sisler—10 pages
53. Coal reserves in Clearfield County, Penna.—by J. F. Reese—6 p.
54. Bituminous coal reserves in Pennsylvania, by J. F. Reese—9 pages

55. Coal beds in Lawrence County, Penna.—by J. D. Sisler—3 pages
57. Coal beds in Beaver County, Penna.—by J. D. Sisler—4 pages
64. Coal beds in Southern Somerset County, Penna.—by J. D. Sisler—20 pages
80. Coal beds of Northern Somerset County—by J. D. Sisler— 28 pp.
81. Volatile matter in Pennsylvania coals—by J. D. Sisler—11 pages
84. Coal reserves in Clarion County, Penna.—by J. D. Sisler—10 pp.
85. Coal reserves in Jefferson County, Penna.—by J. D. Sisler—11 pp.

Detailed reports have been issued by the State Survey on the Punxsutawney and Greensburg quadrangles. Detailed reports on the Pittsburgh and New Castle quadrangles are in press, and similar reports on the Curwensville, Houtzdale, and Meyersdale quadrangles are in preparation. The stock of the Punxsutawney and Greensburg atlases was destroyed by fire Saturday, May 7, 1927, and therefore these atlases are no longer obtainable from official sources.

INDEX

PENNSYLVANIA
GEOLOGICAL SURVEY
FOURTH SERIES

BULLETIN M6

BITUMINOUS COAL FIELDS OF PENNSYLVANIA

INTRODUCTORY VOLUME
PART III.

COAL RESOURCES

BY
JOHN F. REESE
AND
JAMES D. SISLER

Department of Forests and Waters
C. E. Dorworth, Secretary
Topographic and Geologic Survey
G. H. Ashley, State Geologist

LETTER OF TRANSMITTAL

C. E. Dorworth, Secretary,
Department of Forests and Waters.

Sir:

I have the honor to present herewith Bulletin M6, Part III, a report on the Bituminous Coal Resources in Pennsylvania. Part I, now being written by the State Geologist, will discuss the origin, character and use of bituminous coal in Pennsylvania. Part II, a detailed description of coal beds, by James D. Sisler, was published in June, 1926. Part IV, Bituminous Coal Analyses, was published in January, 1925.

The original computation of bituminous coal reserves is the work of John F. Reese, a mining engineer widely familiar with the coal fields of western Pennsylvania. A summary of the results was published in mimeographed form as the computation in each county was completed. This bulletin presents all the data which were contained in the mimeographed reports, and in addition much more detailed information.

This bulletin is of particular value to State and county officials, mine operators, mining engineers, and students of mineral conservation. The information contained herein is the basis upon which taxes can be levied, and sites for mining operations and their accompanying industries can be selected. It is also a guide in determining coal legislation and in planning future industrial expansion.

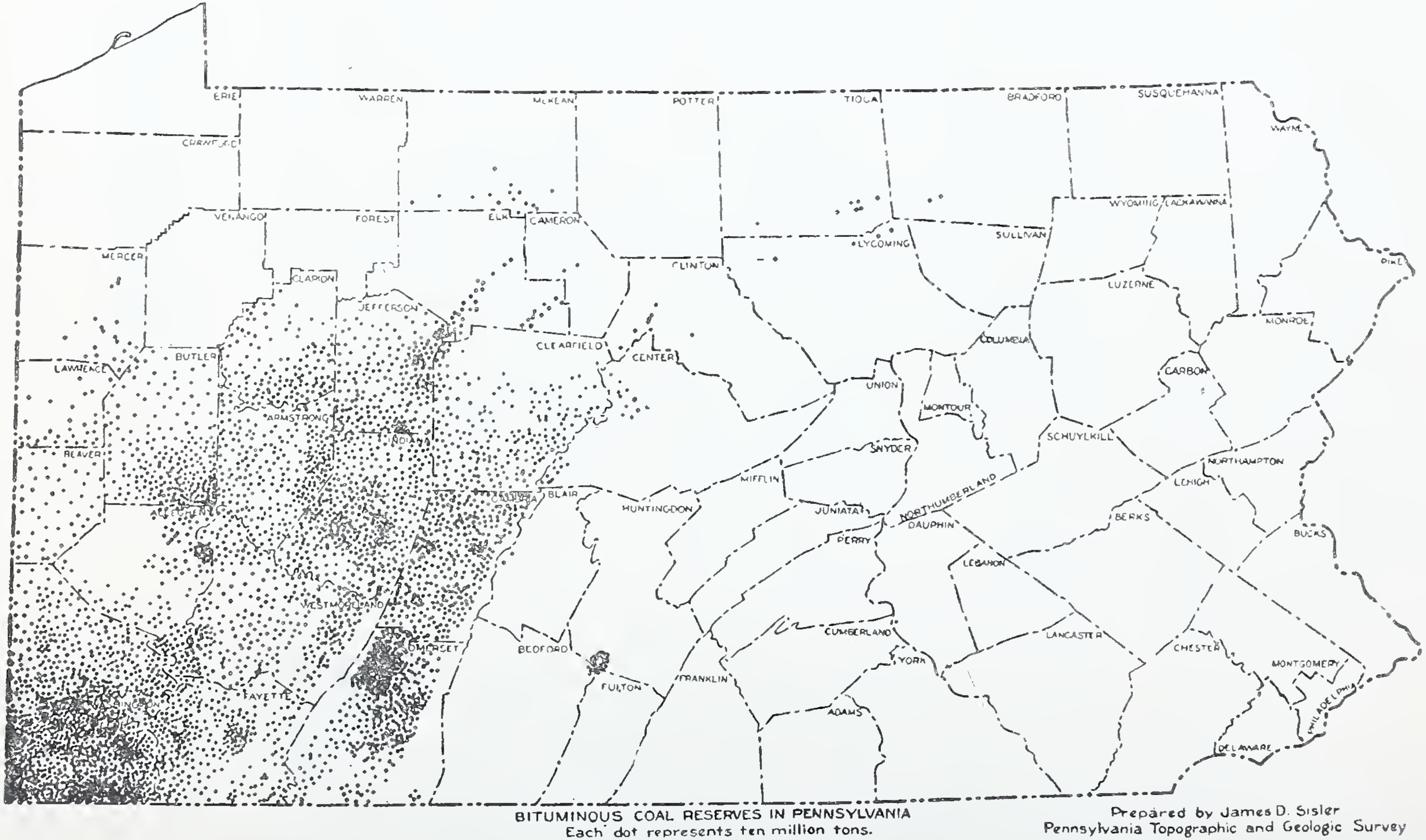
James D. Sisler subdivided the coal resources of numerous counties into resources by townships and recalculated the resources in some townships where additional information has been obtained. The report was compiled by Mr. Sisler and edited by Ralph W. Stone.

Respectfully,

Geo. H. Ashley

State Geologist.

February 1, 1927.



Map of Pennsylvania showing graphically the distribution of bituminous coal reserves.

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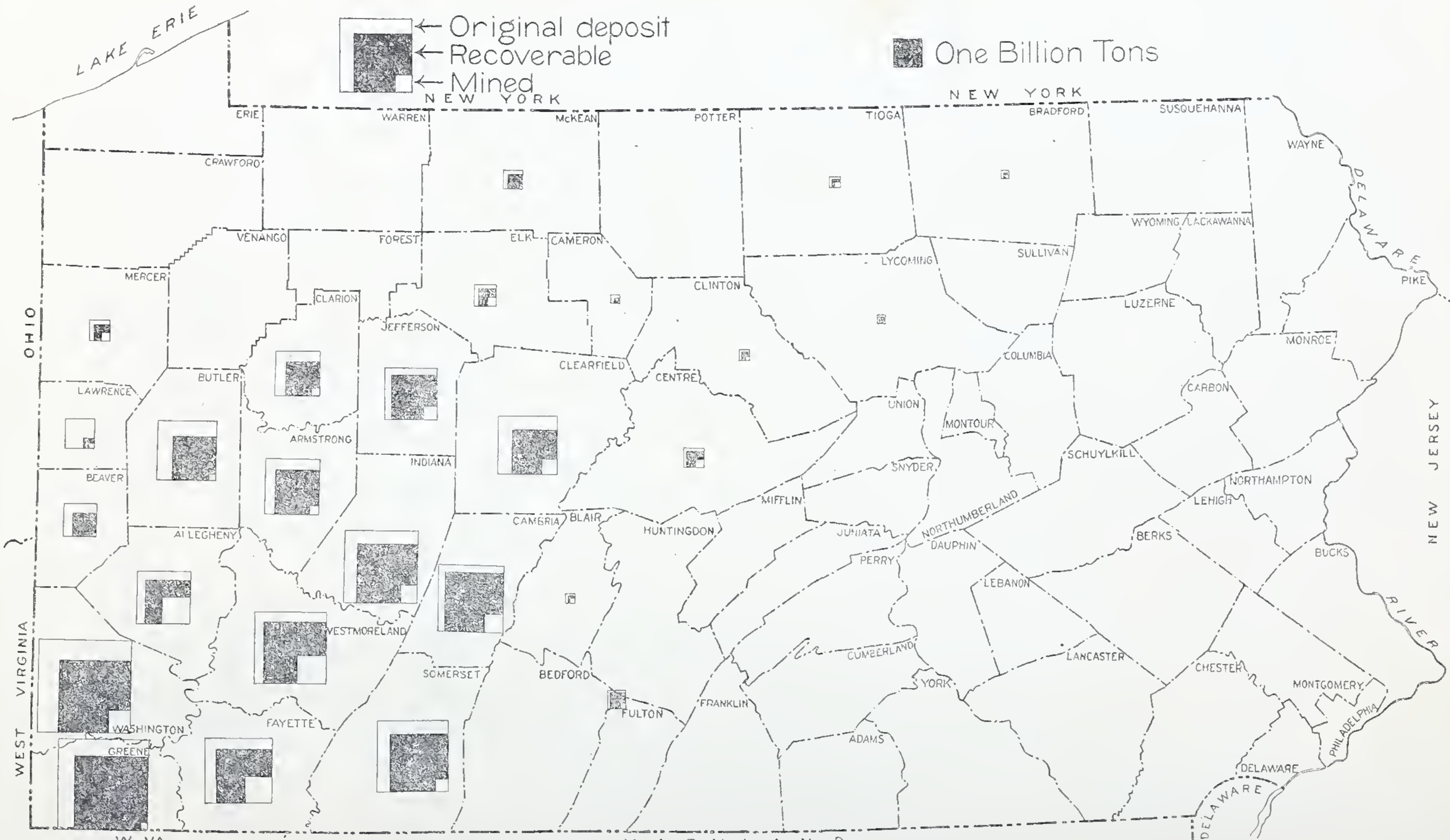
ILLUSTRATIONS



COAL RESERVES OF PENNSYLVANIA
(BITUMINOUS)

BITUMINOUS COAL FIELDS OF PENNSYLVANIA

COAL RESOURCES

By

John F. Reese and James D. Sisler

INTRODUCTION

The first estimate of bituminous coal reserves in Pennsylvania was made by M. R. Campbell of the United States Geological Survey in 1909[1]. Mr. Campbell estimated that Pennsylvania had 14,200 square miles of bituminous coal area, in which was contained, before mining began, 112,474,000,000 short tons. He estimated that the supply remaining unmined at the close of 1907 was 109,804,000,000 tons, or 492 times the production of that year.

Since 1909 the production of soft coal in Pennsylvania has increased, and hundreds of openings have been made since that date. Thousands of dollars have been spent in core drilling and prospecting; large areas have been mapped in detail geologically; coal outcrops have been more accurately established. With the accumulation of much data, and a growing desire by the people of Pennsylvania to know more accurately how much coal is left in the ground, and how long it is going to last, the Pennsylvania Geological Survey, late in 1921, began an investigation to determine more accurately the quantity of Pennsylvania's soft coal resources.

The original work was done by John F. Reese, and occupied a period of nine months. An additional six months was spent by James D. Sisler in revising and supplementing the original work. This revision incorporated information compiled by him for the United States Coal Commission on Coal Losses and Mining Methods in Pennsylvania; a careful and extensive study, and additional information which has been gathered to and including 1926.

[1]U. S. Geological Survey Bulletin 394, p. 23, 1909.

METHODS OF COMPUTING COAL RESOURCES

At the best, a computation of coal resources is an extremely abstract problem. To be of real value, such a computation must have as its foundation all available data. In this estimate, facts regarding the area, thickness and physical character of each coal bed, were assembled from many sources; namely, from the reports of the United States Geological Survey; the four geological surveys of Pennsylvania, diamond drill records, mine maps, mine operators' reports, and from personal interviews with mine operators, mining engineers, mine inspectors, and geologists thoroughly familiar with the coal field.

After all the data had been assembled, a base map was made for each coal bed in each county, by tracing its outcrop from the latest available geological maps. All measurements of the coal bed were placed upon the map at the places where they were made. Lines of equal coal thickness were plotted on the map; their proper position was determined by studying the distribution of the measurements. These lines represented variations of 2 to 12 inches in thickness, depending upon the number of available measurements. The area of coal occurring between two lines of equal thickness (for example, the area between 48 and 50 inches) was measured by a planimeter, an instrument which accurately measures plane areas. In calculating the tonnage, the average of the bounding lines of equal thickness was used. For example, if the lines were 48 and 50 inches, the average thickness, or 49 inches, was used in calculating the coal content of the area between the lines. After the area of each zone of equal thickness in each township was measured, in square miles, the total area was multiplied by the average thickness. This result was multiplied by 90,000 tons, the quantity of coal contained per inch of bed, per square mile of area.

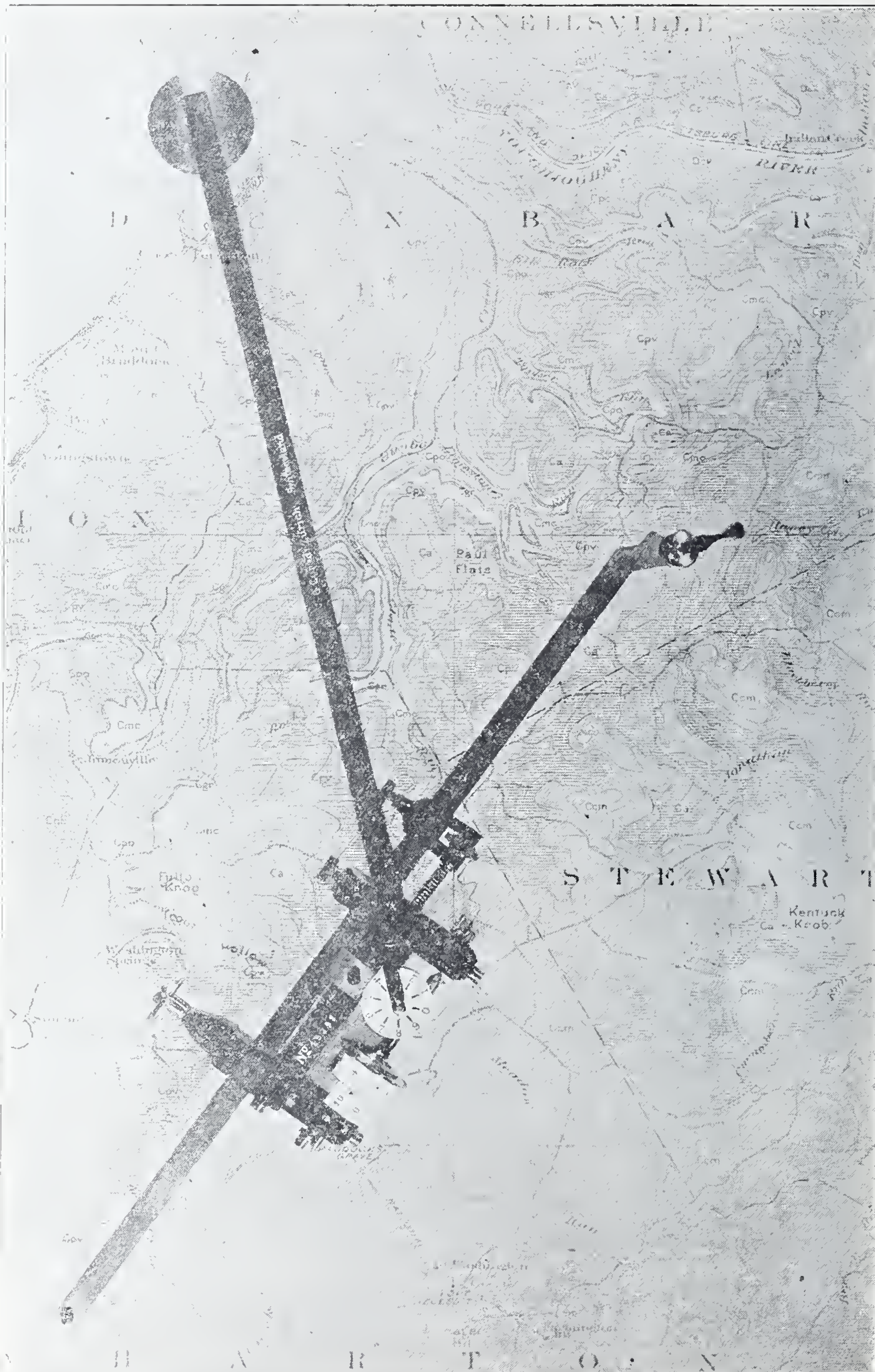
Mr. Sisler, in computing the coal resources in Clarion and Jefferson counties, used 97,000 tons per inch of bed per square mile of area. An unusual number of specific gravity determinations enabled this very accurate estimate. Mr. Reese, in using 90,000 tons per inch of bed per square mile of area, was purposely ultra conservative. *If 97,000 tons had been used throughout, the estimate of 44,022,840,000 tons of recoverable coal would be increased 7/100 times, or approximately 3 billion tons.*

After the quantity of coal originally contained within the area of each bed in each township had been determined, the quantity mined out was then subtracted. The remainder was the quantity of unmined coal in place. The writers determined from engineering experience and from the opinions of local mining engineers and operators, the probable percentage of each bed which could be recovered in each locality. The quantity of coal computed to be in

PLATE III

Map of Connellsville quadrangle showing data for computing tonnage of Pittsburgh coal.

PLATE IV



Planimeter, an instrument which measures plane areas. This instrument, shown here on a geologic map, was used for measuring the areas underlain by coal.

any bed, multiplied by the assumed percentage of recoverable coal, less 15 per cent for loss in mining gave the estimated recoverable tonnage.

Mr. Sisler, in his computations on Clarion and Jefferson counties, used the following method, mainly as a check against Mr. Reese' method. The results were almost identical.

The quantity of coal mined out and lost was determined in the following manner: The total production tonnage of the county was obtained from reports of the United States Geological Survey; to this quantity of coal was added another quantity representing the coal lost in mining. The total of these two figures represents the total quantity of coal mined out and lost. This quantity of coal was distributed among the townships according to the extent of mining in each township.

The quantity of coal mined out and lost was subtracted from the quantity of coal originally present. The result of this subtraction represents the quantity of coal remaining. To determine the quantity of recoverable coal, the quantity remaining was multiplied by a certain percentage of recovery, which was different in every bed and in each township.

The result of computing the bituminous coal resources of Pennsylvania is shown in the accompanying tables. One table gives the quantity of coal originally deposited, the quantity that has been mined out or made unrecoverable, and the tons that can yet be recovered; the other shows the estimated recoverable tonnage in each bed by counties.

All calculations are in short tons.

In the computation of coal in the original deposit and in reserves, the full coal section was used. This is not always the mineable section, hence the mined out tonnages will seem large for various localities. If only 36 inches of a 42 inch coal bed is being mined, the unmined 6 inches which has been included in the original tonnage of this deposit must be accounted for. As this 6 inches of coal is irrecoverable, it has been considered as such, and included in the mined out tonnage.

Coal less than 18 inches thick has not been considered as an immediate resource and is not included in the estimate.

The most readily accessible and best beds have already been exploited, but before long these beds will be depleted, and the thinner and less easily accessible beds will be developd. The geographical location of Pennsylvania, with its access to the seaboard markets and the industries of New England, will be the great determining factor in the future development of these coals, enabling operators to mine them at greater cost per ton and still compete in the same market with the coals of Ohio, West Virginia, and Kentucky. The difference in freight rates will permit this more expensive mining.

In various counties the coal beds are known by local names, but in this work they have been described and computed according to the following table, which also gives the sequence of the coal beds.

Sequence and correlation of coal beds

Group	Names of beds
Washington	Washington
	Waynesburg A*
Monongahela	Waynesburg
	Uniontown
	Sewickley, Mapleton, Tyson, Berlin
	Redstone
	Pittsburgh, Rider
	Pittsburgh, Price
Conemaugh	Morantown*
	Little Pittsburgh*
	Franklin*
	Lonaconing*
	Hoffman*
	Clarksville*
	Wellersburg*
	Barton*
	Duquesne*
	Harlem*
	Bakerstown, Upper
	Bakerstown, Lower
	Brush Creek*
	Gallitzin*
	Mahoning*
Allegheny	Upper Freeport, E, Kelly
	Lower Freeport, D, Moshannon, Dudley
	Upper Kittanning, C′, Barnettstown, Seymour
	Middle Kittanning, C, Twin Bed, Morgan, Darlington
	Lower Kittanning, B, Barnett, Bloss, Miller
	Scrubgrass*
	Clarion, A′, Fulton, Clermont (in McKean County)
	Brookville, A, Gordon, Bear Creek, Clermont, Pardoe
Pottsville	Homewood, Tionesta (?)*
	Upper Mercer, Upper Alton
	Lower Mercer, Lower Alton
	Quakertown*
	Sharon

*Too thin to be calculated as a coal resource.

As the area of the bituminous coal fields of Pennsylvania is extremely large, and data for an accurate computation of resources in a great portion of it are very meagre, it follows that many corrections will be necessary as future exploring and prospecting reveal new information.

It is respectfully asked and urged that all operators, coal land owners, or any persons who have any reason for criticism of the figures here given send to the Survey the data on which it is based. They should give the number of coal beds, their thickness, and extent, and thus enable this Survey to make a more accurate estimate of our coal resources. All information will be held strictly confidential if the donor so wishes. It is only through such cooperation that a public work can be properly consummated.

As all the information available to the Survey has been used and the greatest care has been exercised in the computations, the figures in the following tables are as accurate as can be made.

The writers wish to publicly acknowledge their very great indebtedness to Ralph W. Stone, Assistant State Geologist, for thorough editing and constructive criticism of this bulletin, and to R. Frank Shaffner, Jr., for much of the planimeter work.

SUMMARY

Bituminous coal resources in Pennsylvania by counties, in short tons

County	Original deposit	Mined out and lost	Recoverable
Allegheny	3,194,820,000	969,200,000	1,498,948,000
Armstrong	3,750,700,000	107,290,000	2,491,100,000
Beaver	1,261,797,000	7,650,000	651,517,000
Blair	78,516,000	23,900,000	36,508,000
Bradford	44,440,000	14,500,000	15,514,000
Broad Top Field	414,954,000	41,850,000	252,918,000
Butler	4,154,897,000	39,300,000	2,257,511,000
Cambria	5,383,000,000	406,900,000	3,638,080,000
Cameron	61,560,000	235,000	33,561,000
Centre	514,485,000	75,250,000	275,076,000
Clarion	2,042,800,000	60,000,000	1,262,300,000
Clearfield	3,992,000,000	308,210,000	2,165,400,000
Clinton	114,380,000	17,221,000	54,580,000
Elk	559,781,000	54,775,000	300,473,000
Fayette	5,229,734,000	899,544,000	2,604,400,000
Greene	9,464,215,000	42,390,000	6,276,251,000
Indiana	6,339,400,000	299,200,000	4,288,700,000
Jefferson	3,334,900,000	279,400,000	2,123,400,000
Lawrence	1,007,866,000	16,445,000	484,020,000
Lycoming	72,000,000	7,000,000	40,000,000
Mercer	499,680,000	80,000,000	224,540,000
McKean	422,865,000	1,615,000	226,303,000
Somerset	6,091,830,000	187,384,000	3,986,900,000
Tioga	155,432,000	48,000,000	55,660,000
Washington	10,526,023,000	557,763,000	5,481,680,000
Westmoreland	6,381,504,000	1,218,141,000	3,297,500,000
Total	75,093,459,000	5,823,163,000	44,022,840,000

Summary of recoverable bituminous coal in Pennsylvania

County	Washington	Waynesburg	Sewickley	Redstone	Pittsburgh	U. Freeport or E	L. Freeport or D	U Kittanning or C
Allegheny				86,625,000	284,723,000	1,127,600,000		
Armstrong					2,800,000	943,000,000	387,100,000	69,900,000
Beaver					3,087,000	171,511,000	53,515,000	
Blair						2,256,000	972,000	1,080,000
Bradford								
Broad Top						38,175,000		
Butler						260,867,000	157,888,000	342,817,000
Cambria						711,920,000	900,730,000	612,430,000
Cameron								
Centre						1,180,000	4,368,000	53,320,000
Clarion						29,200,000	27,700,000	17,800,000
Clearfield						234,560,000	537,500,000	224,200,000
Clinton								
Elk						2,083,000	5,005,000	
Fayette		199,800,000	123,600,000	75,700,000	919,300,000	1,029,000,000		59,600,000
Greene		1,647,859,000	1,119,454,000		2,831,454,000	677,484,000		
Indiana					21,200,000	1,652,800,000	1,374,800,000	
Jefferson						217,600,000	321,400,000	172,600,000
Lawrence						7,179,000	8,395,000	
Lycoming						5,000,000		
Mercer								
McKean								
Somerset			3,400,000		21,500,000[1]	525,700,000	219,600,000	2,188,500,000
Tioga								16,978,000[2]
Washington	2[illegible],540,000	668,380,000		88,000,000	3,516,860,000	995,900,000		
Westmoreland		7,600,000		163,200,000	3,538,300,000	1,859,200,000		
Total	212,540,000	2,523,639,000	1,246,454,000	413,525,000	8,139,224,000	10,492,155,000	3,998,973,000	3,758,625,000

[1]Includes Pittsburgh rider, 5,400,000 tons. [2]Seymour.

Summary of recoverable bituminous coal in Pennsylvania—Continued

County	M. Kittanning or C	L Kittanning or B	Clarion or A′	Brookville or A	Mercer	Sharon	Total
Allegheny							1,498,948,000
Armstrong		1,601,000,000		87,300,000			2,491,100,000
Beaver	123,213,000	267,791,000		32,400,000			651,517,000
Blair		5,600,000		26,600,000			36,508,000
Bradford		3,264,000		12,250,000			15,514,000
Broad Top		80,749,000	133,994,000				252,918,000
Butler	258,593,000	233,562,000	109,059,000	902,725,000			2,257,511,000
Cambria		1,348,100,000	21,300,000	43,600,000			3,638,080,000
Cameron		3,858,000	13,533,000		16,170,000		33,561,000
Centre	24,193,000	77,296,000		114,719,000			275,076,000
Clarion	31,200,000	276,600,000	642,200,000	215,900,000	21,700,000		1,262,300,000
Clearfield	106,800,000	855,300,000		207,100,000			2,165,100,000
Clinton	3,190,000	16,961,000		19,085,000	15,344,000		54,580,000
Elk		24,464,000	117,858,000		151,063,000		300,473,000
Fayette		198,000,000					2,604,400,000
Greene							6,276,251,000
Indiana		1,239,900,000					4,288,700,000
Jefferson	268,660,000	443,100,000		700,700,000			2,123,400,000
Lawrence	119,531,000	149,975,000		154,242,000	44,698,000		484,020,000
Lycoming	15,690,000	20,000,000					40,000,000
Mercer	2,160,000	6,480,000		93,000,000	99,700,000	23,200,000	224,540,000
McKean			104,443,000[3]		121,860,000[5]		226,303,000
Somerset		910,700,000	54,600,000	62,900,000			3,986,900,000
Tioga	[1]115,208,000	6,804,000[2]		16,670,000[4]			55,660,000
Washington							5,481,680,000
Westmoreland	297,500,000	431,700,000					3,297,500,000
Total	1,256,588,000	7,601,204,000	1,196,987,000	2,689,191,000	470,535,000	23,200,000	44,022,840,000

[1]Morgan [2]Bloss [3]Clermont [4]Bear Creek [5]Alton

ALLEGHENY COUNTY

By

John F. Reese

INTRODUCTION

Allegheny County's pre-eminence as an industrial center is primarily due to its location at the confluence of two rivers, its proximity to enormous areas of high-grade steam coal, from which it can draw its power for manufacturing purposes, and to excellent transportation facilities.

Other counties have larger fuel resources, but their geographic location and lack of railroad facilities have hindered the development of commercial enterprises.

The Pittsburgh coal bed, deriving its name from its type locality in Allegheny County, was for many years the only coal used for steam purposes in manufacturing plants in western Pennsylvania. This bed has yielded 878,000,000 tons of coal from Allegheny County alone, for generating power and heat. Only 285,000,000 tons remain to be recovered; but Allegheny County has many other beds of coal. The total is thirty, most of which are not mineable. However, the Upper Freeport bed contains 1,100,000,000 tons of recoverable coal, equal in quality to the Pittsburgh. Other workable coal beds are the Redstone and the Kittanning. The Redstone is mined, but a coal at the horizon of one of the Kittanning beds is far below the surface and is known only from drill records.

The greatest coal resource in Allegheny County is in the Allegheny group, which contains the Kittanning and Freeport coal beds. This group outcrops on Allegheny River, north of Pittsburgh, and on Pine Creek, in the north-central part of the county, but lies deep under the remainder of the county.

Practically the entire county is dotted by shafts, slopes and drifts; in the main, mine openings are near railroads in the valleys of streams and rivers.

COAL BEDS

Allegheny County has three coal beds that are of economic value at the present time. In order of importance as shipping coals, they are; Pittsburgh, Upper Freeport, and Redstone.

Pittsburgh coal. The extensive development and outcrop of this bed throughout the county have furnished many measurements of its thickness, and make possible an accurate and reliable computation of quantity and quality.

For some localities no information is available as to extent of mined out areas. An estimate of probable depletion has been based upon age of development and the size of surrounding operations in these localities, or on the difference between original areas and of areas unmined.

Upper Freeport coal. The occurrence of this bed has been divided into two areas, the Thick Freeport and the Thin Freeport.

From available data, an accurate map of this bed has been made which closely defines the limits of the Thick Freeport coal. It shows the "faulted" area in the southeastern part of the county, and the extent and general thickness range of the Thin Freeport within the county.

The areas of thick and thin coal have been separated in order to make an estimate of the quantity of coal in each area, and to enable this Survey to keep, in the future, an accurate account of the quantity mined from these two fields. *The Thick Freeport is a local thickening of the Upper Freeport, and not a combination of the Upper and Lower Freeport.*

This coal will assume greater importance as an economic factor each year, due to rapid depletion of the Pittsburgh bed.

Redstone coal. This bed has been computed and considered of economic importance in eight townships.

A fair number of measurements of it on its outcrops and in mines have made possible a fairly accurate estimate of quantity.

A conservative percentage of recovery has been assumed for this bed, because, when the underlying Pittsburgh coal has been mined, the intervening rocks will cave, thus breaking this bed and making recovery of this coal both difficult and costly.

Other beds are mined for local use, but as they are not important, and as little is known of their extent and thickness, they have not been included in the computation of the resources.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the order following: Pittsburgh, Upper Freeport, and Redstone. Thus, while the

figures for the Pittsburgh bed are conservative and probably reliable, the figures for the Redstone coal may be much too small or many times too large.

Coal resources in Allegheny County

Bed	Original deposit	Mined out	Recoverable
Pittsburgh	1,245,320,000	877,900,000	284,723,000
Thick Freeport	818,800,000	72,100,000	570,300,000
Thin Freeport	961,800,000	16,200,000	557,300,000
Redstone	168,900,000	3,000,000	86,625,000
Total	3,194,820,000	969,200,000	1,498,948,000

Summary of recoverable coal in Allegheny County

Township or Boro.	Redstone	Pittsburgh	Upper Freeport	
			Thick Freeport	Thin Freeport
Baldwin		10,200,000		16,500,000
Bethel		41,300,000		12,000,000
Braddock		4,800,000		21,000,000
Collier		10,300,000		
Elizabeth	30,300,000	10,300,000		59,200,000
Fawn				26,700,000
Findley		26,100,000		
Forward	30,000,000	21,600,000		63,000,000
Frazer			20,400,000	11,700,000
Greentree Boro.		900,000		
Hampton			32,300,000	8,000,000
Harmar			31,800,000	
Harrison				8,700,000
Indiana			87,200,000	5,600,000
Jefferson	15,200,000	17,800,000		28,000,000
Lincoln	600,000			9,500,000
Lower St. Clair				1,600,000
Mifflin	4,000,000	2,500,000		60,200,000
Moon		400,000		
N. Fayette		35,800,000		
N. Versailles		400,000		26,700,000
O'Hara			33,400,000	17,700,000
Patton		900,000	900,000	44,400,000
Penn		2,100,000	46,500,000	27,300,000
Pittsburgh City		1,100,000		26,400,000
Plum		4,400,000	141,600,000	2,900,000
Portvue Boro.	1,100,000			10,100,000
Richland			38,700,000	5,000,000
Robinson		3,300,000		
Scott		10,000,000		
Shaler				3,500,000
Snowden	2,970,000	22,600,000		13,000,000
South Fayette		17,800,000		
Springdale			13,000,000	
Stowe		400,000		
Union and West Liberty	4,455,000	5,123,000		
Upper St. Clair		33,600,000		
Versailles				23,300,000
West Deer			124,500,000	6,100,000
Wilkins		1,000,000		19,200,000
Total	86,625,000	284,723,000	570,300,000	557,300,000

Coal resources in Allegheny County by townships

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mineable per cent	Mining loss per cent	Thickness (Inches)
Baldwin Township							Area 17.5 square miles
Pittsburgh	14.4	87,800,000	75,100,000	10,200,000	90	10	66–72
U. Freeport	14.5	32,600,000		16,500,000	60	15	24–30
Total		120,400,000	75,100,000	26,700,000			
Bethel Township							Area 11.1 square mile
Pittsburgh	11.1	65,900,000	14,800,000	41,300,000	90	10	66
U. Freeport	9.7	23,800,000		12,000,000	60	15	24–36
Total		89,700,000	14,800,000	53,300,000			
Braddock Township							Area 8.7 square miles
Pittsburgh	1.3	8,800,000	8,200,000	4,800,000	90	10	76
U. Freeport	8.7	35,400,000		21,000,000	70	15	30–80
Total		44,200,000	8,200,000	25,800,000			
Chartiers Township							Area 4.1 square miles
Pittsburgh	.3	1,800,000	1,800,000				68
Collier Township							Area 13.1 square miles
Pittsburgh	7.9	46,500,000	33,700,000	10,300,000	90	10	60–6[illegible]
Elizabeth Township							Area 22.4 square miles
Pittsburgh	17.9	121,800,000	94,900,000	20,300,000	90	10	70–95
U. Freeport	21.7	99,600,000		59,200,000	70	15	24–70
Redstone	14.0	69,400,000	800,000	20,300,000	60	15	48
Total		281,800,000	95,700,000	99,800,000			
Fawn Township							Area 13.4 square miles
U. Freeport	9.7	35,700,000	7,000,000	26,700,000	90	15	40–52
Findley Township							Area 32.6 square miles
Pittsburgh	7.2	35,800,000	6,400,000	26,100,000	90	10	60–68
Forward Township							Area 20.3 square miles
Pittsburgh	16.8	105,100,000	78,300,000	21,600,000	90	10	68–70
U. Freeport	20.3	106,600,000		63,000,000	70	15	30–70
Redstone	15.0	59,400,000	400,000	30,000,000	60	15	44
Total		270,500,000	78,700,000	114,600,000			

Coal resources in Allegheny County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mineable per cent	Mining loss per cent	Thickness (Inches)
Franklin Township					Area 13.7 square miles		
Pittsburgh	.1	600,000	600,000				72
Frazer Township					Area 13.4 square miles		
Th. Freeport	7.7	52,600,000	25,900,000	20,400,000	90	15	76
U. Freeport	4.5	17,600,000	2,200,000	11,700,000	90	15	42–52
Total		70,200,000	28,100,000	32,100,000			
Greentree Borough					Area 4.3 square miles		
Pittsburgh	2.7	16,500,000	15,300,000	900,000	90	10	68
Hampton Township					Area 16.2 square miles		
Th. Freeport	6.2	42,400,000		32,300,000	90	15	76
U. Freeport	5.6	16,100,000		8,000,000	60	15	24–50
Total		58,500,000		40,300,000			
Harmar Township					Area 6.7 square miles		
Th. Freeport	6.7	45,800,000	4,100,000	31,800,000	90	15	76
Harrison Township					Area 8.6 square miles		
U. Freeport	5.0	18,100,000	6,600,000	8,700,000	90	15	40–48
Indiana Township					Area 19.4 square miles		
Th. Freeport	17.0	116,200,000	2,000,000	87,200,000	90	15	76
U. Freeport	2.4	9,500,000		5,600,000	70	15	30–50
Total		125,700,000	2,000,000	92,800,000			
Jefferson Township					Area 22.7 square miles		
Pittsburgh	12.1	78,000,000	55,900,000	17,800,000	90	10	70–74
U. Freeport	22.7	55,000,000		28,000,000	60	15	24–36
Redstone	7.5	27,000,000	1,000,000	13,200,000	60	15	40
Total		160,000,000	56,900,000	59,000,000			
Lincoln Township					Area 5.8 square miles		
Pittsburgh	1.2	8,200,000	8,200,000				70–85
U. Freeport	5.8	16,000,000		9,500,000	70	15	25–40
Redstone	.5	1,600,000	300,000	600,000	60	15	36
Total		25,800,000	8,500,000	10,100,000			
Lower St. Clair Township					Area 1.3 square miles		
Pittsburgh	.6	3,600,000	3,600,000				68
U. Freeport	1.3	2,800,000		1,600,000	70	15	24
Total		6,400,000	3,600,000	1,600,000			

In these Allegheny County tables Th. Freeport means Thick Freeport.

Coal resources in Allegheny County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mineable per cent	Mining loss per cent	Thickness (Inches)
Mifflin Township							Area 24.4 square miles
Pittsburgh	13.6	88,300,000	85,200,000	2,500,000	90	10	70–74
U. Freeport	24.4	101,400,000	----------	60,200,000	70	15	24–90
Redstone	3.0	8,100,000	200,000	4,000,000	60	15	[illegible]
Total	----------	197,800,000	85,400,000	66,700,000	----------	----------	----------
Moon Township							Area 24.8 square miles
Pittsburgh	.8	4,400,000	3,800,000	400,000	90	10	60–68
North Fayette Township							Area 25.5 square miles
Pittsburgh	14.3	81,600,000	37,300,000	35,800,000	90	10	60–68
North Versailles Township							Area 9.7 square miles
Pittsburgh	3.2	20,400,000	19,800,000	400,000	90	10	70–72
U. Freeport	7.5	45,000,000	----------	26,700,000	70	15	34–40
Total	----------	65,400,000	19,800,000	27,100,000	----------	----------	----------
O'Hara Township							Area 14.8 square miles
Th. Freeport	6.4	43,700,000	----------	33,400,000	90	15	76
U. Freeport	8.4	29,900,000	----------	17,700,000	70	15	30–50
Total	----------	73,600,000	----------	51,100,000	----------	----------	----------
Patton Township							Area 21.4 square miles
Pittsburgh	1.3	8,800,000	7,500,000	900,000	90	10	76
Th. Freeport	.2	1,300,000	----------	900,000	90	15	76
U. Freeport	16.0	74,800,000	----------	44,400,000	70	15	24–40
Total	----------	84,900,000	7,500,000	46,200,000	----------	----------	----------
Penn Township							Area 20.5 square miles
Pittsburgh	6.4	43,700,000	41,000,000	2,100,000	90	10	76
Th. Freeport	9.2	62,900,000	2,000,000	46,700,000	90	15	76
U. Freeport	11.3	46,000,000	----------	27,100,000	70	15	26–[illegible]
Total	----------	152,600,000	43,000,000	75,900,000	----------	----------	----------
Pine Township							Area 17.2 square miles
Pittsburgh	.1	600,000	600,000	----------	----------	----------	72
Pittsburgh City							Area 42.1 square miles
Pittsburgh	3.7	23,500,000	22,100,000	1,100,000	90	10	68–76
U. Freeport	20.8	51,900,000	----------	26,400,000	70	15	24–36
Total	----------	75,400,000	22,100,000	27,500,000	----------	----------	----------

Coal resources in Allegheny County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mineable per cent	Mining loss per cent	Thickness (Inches)
Plum Township							Area 31.1 square miles
Pittsburgh	4.0	27,300,000	21,800,000	4,400,000	90	10	76
Th. Freeport	27.8	190,000,000	4,700,000	141,600,000	90	15	76
U. Freeport	1.3	4,900,000		2,900,000	70	15	34–50
Total		222,200,000	26,500,000	148,900,000			
Portvue Boro.							Area 5.0 square miles
Pittsburgh	1.6	10,200,000	10,200,000				70–72
U. Freeport	4.9	17,100,000		10,100,000	70	15	24–46
Redstone	.8	2,500,000	300,000	1,100,000	60	15	36
Total		29,800,000	10,500,000	11,200,000			
Richland Township							Area 14.8 square miles
Th. Freeport	7.4	50,600,000		38,700,000	90	15	76
U. Freeport	3.3	10,100,000		5,000,000	60	15	24–50
Total		60,700,000		43,700,000			
Robinson Township							Area 16.9 square miles
Pittsburgh	6.0	34,700,000	30,600,000	3,300,000	90	10	64–68
Scott Township							Area 13.0 square miles
Pittsburgh	10.2	60,600,000	48,200,000	10,000,000	90	10	62–68
Shaler Township							Area 12.5 square miles
U. Freeport	3.0	7,000,000		3,500,000	60	15	24–30
Snowden Township							Area 10.2 square miles
Redstone	2.2	3,960,000		2,970,000	90	15	20
Pittsburgh	7.1	44,400,000	16,500,000	22,600,000	90	10	66–72
U. Freeport	10.2	25,600,000		13,000,000	60	15	24–36
Total		73,960,000	16,500,000	38,570,000			
South Fayette Township							Area 21.3 square miles
Pittsburgh	19.6	108,500,000	86,500,000	17,800,000	90	10	62–68
South Versailles Township							Area .9 square miles
Pittsburgh	.3	2,400,000	2,400,000				90
Springdale Township							Area 4.2 square miles
Th. Freeport	4.2	28,700,000	11,600,000	13,000,000	90	15	76

Coal resources in Allegheny County by townships—Continued

Bed	Work-able Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mineable per cent	Mining loss per cent	Thick-ness (Inches)
Stowe Township							Area 8.7 square miles
Pittsburgh	.5	2,800,000	2,300,000	400,000	90	10	64
Union and West Liberty Township							Area 4.[illegible] square miles
Redstone	3.3	5,940,000	----------	4,455,000	90	15	20
Pittsburgh	3.86	13,623,000	8,500,000	5,123,000	90	10	68
Total	----------	19,563,000	8,500,000	9,578,000	----------	----------	----------
Upper St. Clair Township							Area 11.6 square miles
Pittsburgh	10.6	62,500,000	20,900,000	33,600,000	90	10	62-66
Versailles Township							Area 12.2 square miles
Pittsburgh	.3	1,800,000	1,800,000	----------	----------	----------	70
U. Freeport	8.2	39,200,000	----------	23,300,000	70	15	34-40
Total	----------	41,000,000	1,800,000	23,300,000	----------	----------	----------
West Deer Township							Area 29.3 square miles
Th. Freeport	27.0	184,600,000	21,800,000	124,500,000	90	15	76
U. Freeport	1.8	8,400,000	400,000	6,100,000	90	15	52
Total	----------	193,000,000	22,200,000	130,600,000	----------	----------	----------
Wilkins Township							Area 7.1 square miles
Pittsburgh	3.2	21,800,000	20,500,000	1,000,000	90	10	76
U. Freeport	7.1	32,300,000	----------	19,200,000	70	15	36-80
Total	----------	54,100,000	20,500,000	20,200,000	----------	----------	----------

ARMSTRONG COUNTY

By

John F. Reese

INTRODUCTION

Armstrong County contains the largest resource of easily accessible high volatile coal in the State. Locally the coal is high in sulphur, but can be cleaned by washing. After the high volatile coals in Westmoreland County have been exhausted, Armstrong County coals will have much greater demand for use in gas manufacture.

Armstrong County has approximately twenty coal beds, two of which, the Upper Freeport and the Lower Kittanning, have great value in large areas. The Upper Kittanning, Lower Freeport, Pittsburgh and Brookville beds are mineable in more restricted areas. The coals are regular in thickness, uniform in quality, and can be easily mined by drift or slope at almost every point.

At the present time, three-fourths of the mining is along the bank of Allegheny River and its large tributaries. In several townships the coal is practically untouched by mining.

COAL BEDS

Armstrong County has six coal beds that are now of economic interest. In order of present importance as shipping coals they are: the Upper Freeport, Lower Kittanning, Upper Kittanning, Lower Freeport, Pittsburgh, and Brookville.

Upper Freeport coal. The extensive development and outcrop of this bed throughout the county have furnished many measurements of its thickness, which has made possible an accurate estimate of quantity.

The percentage of recovery in this bed is governed by the sequence in which the Upper and Lower Freeport coals are mined. If the Lower Freeport bed is worked first and pillars are drawn, the overlying rocks will cave and break the Upper Freeport bed, thereby causing a partial and in many places complete loss of that coal.

The Upper Freeport bed contains the second largest resource within the county, and is the largest producer, yielding more than 3,500,000 tons annually.

Lower Kittanning coal. Throughout the townships in the northern half of the county where this coal outcrops a fair quantity of information as to its thickness and persistency is available. In the townships in the southern half, data are meager, and a general average based on thickness in surrounding areas was assumed, and a low percentage of recovery allowed because the extent and thickness of this bed are not accurately known.

This bed contains the greatest coal resource within the county, and ranks second in production with a total of over 1,500,000 tons annually.

Upper Kittanning coal. Little information as to the extent and thickness of this bed is available, except from its recognized outcrop and the developments in a few localities. This bed is extremely variable in section and thickness. It attains great height in local troughs or channels 200 to 300 yards in width, and thins to 12 inches or less at the trough limits. It is known as the "Pot Vein" because of this peculiarity. The Upper Kittanning bed in these troughs is a cannel coal, with 24 inches and less of bituminous coal under the cannel. Where available measurements show sufficient thickness for mining, the presence of small workable areas contiguous to the place of measurement were assumed. The quantity of coal was computed from the average thickness of the bed in that vicinity. A low percentage of recovery has been adopted, owing to the extreme variation in persistency and extent.

The Upper Kittanning coal is fifth in size of resource in the county, and ranks third in production with a total of over 300,000 tons annually.

Lower Freeport coal. A fair number of measurements of the thickness of this coal are available from its outcrop and development, making possible a fairly accurate computation of quantity.

Little is known as to its extent and thickness in large areas and a general average based on thickness in surrounding areas was used to calculate the recoverable tonnage.

A low percentage of recovery was adopted for this reason, and also because of the general "faulty" condition of the bed where it is mined.

The Lower Freeport coal is third in size of resource within the county, and ranks fourth in production with a total of over 200,000 tons annually.

Pittsburgh coal. The extensive development and long outcrop of this bed furnish a fair number of measurements of its thickness, thus making possible a reliable computation of quantity.

Owing to lack of knowledge of the extent and persistency of coals not mentioned herein, the Pittsburgh bed is considered as sixth

in size of resource within the county. It is fifth in production, with a total of over 120,000 tons annually.

Brookville coal. This bed has economic importance in eight townships, all of which are in the Mahoning basin. Little information as to extent and persistency of this coal is available, therefore the computations for these townships are based upon general average thicknesses, to accord with measurements in adjoining areas. A low percentage of recovery has been adopted for this reason.

The best available information indicates that this bed is fourth in size of resource within the county, and ranks sixth in production with a total of over 8,500 tons annually.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the order following: Pittsburgh, Upper Freeport, Lower Kittanning, Lower Freeport, Upper Kittanning, and Brookville. The figures for the Pittsburgh bed are conservative and probably reliable, but the figures for for the Brookville coal may be much too small or many times too large.

Coal resources in Armstrong County

Bed	Original deposit	Mined out and lost	Recoverable
Pittsburgh	17,500,000	13,900,000	2,800,000
Upper Freeport	1,288,300,000	60,350,000	943,000,000
Lower Freeport	607,000,000	5,000,000	387,100,000
Upper Kittanning	131,500,000	4,500,000	69,900,000
Lower Kittanning	1,541,200.000	23.510,000	1,001,000,000
Brookville	165,200,000	30,000	87,300,000
Total,	3,750,700,000	107,290,000	2,491,100,000

Summary of recoverable coal in Armstrong County

Township or Boro.	Pittsburgh	U. Freeport	L. Freeport	U. Kittanning	L. Kittanning	Brookville
Bethel	------	34,400,000	13,000,000	------	34,300,000	------
Boggs	------	26,400,000	19,000,000	1,800,000	51,300,000	18,000,000
Bradys Bend	------	12,800,000	------	3,000,000	20,700,000	------
Burrell	------	33,100,000	------	------	39,300,000	------
Cowanshannock	------	125,400,000	77,700,000	15,[illegible]00,000	104,[illegible]00,000	9,900,000
E. Franklin	------	34,100,000	35,300,000	2,000,000	59,800,000	------
Gilpin	------	25,400,000	1,800,000	5,300,000	37,000,000	------
Hovey	------	------	------	------	------	1,000,000
Kiskiminetas	1,100,000	106,200,000	------	7,000,000	17,900,000	------
Kittanning	------	63,800,000	16,300,000	2,900,000	60,900,000	------
Madison	------	900,000	------	------	18,000,000	3,800,000
Mahoning	------	18,400,000	10,400,000	1,300,000	12,600,000	12,400,000
Manor	------	30,700,000	18,200,000	------	39,200,000	------
N. Buffalo	------	37,100,000	20,700,000	4,400,000	60,900,000	------
Parks	------	30,400,000	------	------	22,500,000	------
Perry	------	15,100,000	------	------	18,700,000	------
Pine	------	2,900,000	2,900,000	------	4,400,000	3,000,000
Plum Creek	------	101,800,000	82,000,000	900,000	71,300,000	------
Rayburn	------	13,600,000	10,400,000	------	16,200,000	------
Redbank	------	8,500,000	7,400,000	1,300,000	31,000,000	5,200,000
South Bend	1,700,000	52,000,000	16,500,000	------	9,100,000	------
S. Buffalo	------	47,200,000	1,000,000	------	58,300,000	------
Sugar Creek	------	39,500,000	------	3,200,000	65,000,000	------
Valley	------	18,700,000	13,700,000	2,300,000	17,200,000	------
Washington	------	4,100,000	3,100,000	4,000,000	34,100,000	------
Wayne	------	48,800,000	25,600,000	12,800,000	64,600,000	34,000,000
W. Franklin	------	9,700,000	11,300,000	1,300,000	29,700,000	------
Total	2,800,000	943,000,000	337,100,000	69,900,000	1,001,000,000	87,300,000

Coal resources in Armstrong County by townships

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Bethel Township							Area 16.1 square miles
U. Freeport	12.2	45,700,000	7,600,000	34,400,000	90	15	38–42
L. Freeport	5.4	19,400,000	200,000	13,000,000	80	15	30–40
L. Kittanning	16.1	50,800,000	300,000	34,300,000	80	15	32–42
Total	------	115,900,000	7,500,000	81,700,000	------	------	------
Boggs Township							Area 24.6 square miles
U. Freeport	10.5	34,600,000	------	26,400,000	90	15	28–48
L. Freeport	10.7	28,900,000	------	19,600,000	80	15	30–60
U. Kittanning	1.0	3,700,000	------	1,800,000	60	15	0–48
L. Kittanning	18.8	75,900,000	400,000	51,300,000	80	15	0–48
Brookville	10.4	35,300,000	------	18,000,000	60	15	0–48
Total	------	178,400,000	400,000	117,100,000	------	------	------
Bradys Bend Township							Area 14.0 square miles
U. Freeport	5.5	20,900,000	4,100,000	12,800,000	90	15	18–66
U. Kittanning	1.8	7,200,000	------	3,000,000	60	15	0–60
L. Kittanning	8.2	32,500,000	5,400,000	20,700,000	90	15	30–48
Total	------	60,600,000	9,500,000	37,100,000	------	------	------

Coal resources in Armstrong County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Burrell Township							Area 22.1 square miles
U. Freeport	11.5	43,300,000		33,100,000	90	15	0-42
L. Kittanning	21.0	58,700,000		39,900,000	80	15	28-36
Total		102,000,000		73,000,000			
Cowanshannock Township							Area 53.8 square miles
U. Freeport	41.7	183,200,000	19,200,000	125,400,000	90	15	24-70
L. Freeport	41.0	132,300,000	1,600,000	77,700,000	80	15	28-60
U. Kittanning	7.3	30,100,000		15,300,000	60	15	0-96
L. Kittanning	50.4	153,900,000		104,000,000	80	15	24-36
Brookville	7.2	19,500,000		9,900,000	60	15	0-60
Total		519,000,000	20,800,000	332,300,000			
East Franklin Township							Area 33.3 square miles
U. Freeport	12.3	45,700,000	1,100,000	34,100,000	90	15	0-48
L. Freeport	13.9	52,400,000	400,000	35,300,000	80	15	0-60
U. Kittanning	1.2	5,100,000		2,600,000	60	15	0-60
L. Kittanning	23.8	82,700,000	4,500,000	59,800,000	90	15	30-60
Total		185,900,000	6,000,000	131,800,000			
Gilpin Township							Area 17.6 square miles
U. Freeport	13.0	46,600,000	13,300,000	25,400,000	90	15	36-40
L. Freeport	1.0	2,700,000		1,800,000	80	15	0-36
U. Kittanning	3.0	10,800,000	1,800,000	5,300,000	70	15	0-42
L. Kittanning	17.6	55,700,000	300,000	37,600,000	80	15	28-42
Total		115,800,000	15,400,000	70,100,000			
Hovey Township							Area 3.6 square miles
Brookville	.5	1,600,000		1,000,000	80	15	0-40
Kiskiminitas Township							Area 42.7 square miles
Pittsburgh	1.5	10,300,000	8,900,000	1,100,000	90	15	60-80
U. Freeport	33.7	140,100,000	1,200,000	106,200,000	90	15	34-48
U. Kittanning	4.0	12,900,000	1,100,000	7,000,000	70	15	0-36
L. Kittanning	12.0	30,200,000	10,000	17,900,000	70	15	0-36
Total		193,500,000	11,210,000	132,200,000			
Kittanning Township							Area 31.8 square miles
U. Freeport	23.4	86,100,000	10,000	65,800,000	90	15	0-50
L. Freeport	9.0	24,300,000		16,500,000	80	15	0-30
U. Kittanning	1.2	4,000,000		2,000,000	60	15	0-36
L. Kittanning	31.8	102,500,000		60,900,000	70	15	30-36
Total		216,900,000	10,000	145,200,000			

Coal resources in Armstrong County by townships—Continued

Madison Township — Area 31.8 square miles

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
U. Freeport	.3	1,100,000	----------	900,000	90	15	0–50
L. Kittanning	7.1	29,000,000	5,400,000	18,000,000	90	15	0–48
Brookville	2.0	6,400,000	20,000	3,800,000	70	15	0–36
Total	----------	36,500,000	5,420,000	22,700,000	----------	----------	----------

Mahoning Township — Area 25.7 square miles

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
U. Freeport	7.7	29,600,000	5,500,000	18,400,000	90	15	36–48
L. Freeport	6.0	18,900,000	1,300,000	10,400,000	70	15	0–54
U. Kittanning	1.0	3,800,000	1,200,000	1,500,000	70	15	0–144
L. Kittanning	5.5	17,400,000	900,000	12,600,000	90	15	0–36
Brookville	6.1	21,000,000	----------	12,400,000	70	15	0–40
Total	----------	90,700,000	8,900,000	55,300,000	----------	----------	----------

Manor Township — Area 18.7 square miles

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
U. Freeport	10.9	41,700,000	1,500,000	30,700,000	90	15	36–72
L. Freeport	10.0	27,000,000	200,000	18,200,000	80	15	0–36
L. Kittanning	18.0	58,300,000	600,000	39,200,000	80	15	30–36
Total	----------	127,000,000	2,300,000	88,100,000	----------	----------	----------

North Buffalo Township — Area 27.2 square miles

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
U. Freeport	13.8	49,200,000	600,000	37,100,000	90	15	0–48
L. Freeport	9.0	31,300,000	800,000	20,700,000	80	15	0–60
U. Kittanning	2.0	8,600,000	----------	4,400,000	60	15	0–60
L. Kittanning	26.0	92,000,000	2,300,000	60,900,000	80	15	36–60
Total	----------	181,100,000	3,700,000	123,100,000	----------	----------	----------

Parks Township — Area 14.2 square miles

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
U. Freeport	11.4	40,800,000	1,000,000	30,400,000	90	15	34–42
L. Kittanning	14.2	37,800,000	----------	22,500,000	70	15	24–32
Total	----------	78,600,000	1,000,000	52,900,000	----------	----------	----------

Perry Township — Area 15.9 square miles

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
U. Freeport	4.7	19,800,000	----------	15,100,000	90	15	42–54
L. Kittanning	9.6	28,400,000	800,000	18,700,000	80	15	0–42
Total	----------	48,200,000	800,000	33,800,000	----------	----------	----------

Pine Township — Area 5.0 square miles

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
U. Freeport	1.4	3,900,000	40,000	2,900,000	90	15	24–46
L. Freeport	1.2	4,300,000	----------	2,900,000	80	15	0–42
L. Kittanning	2.3	6,600,000	----------	4,400,000	80	15	28–48
Brookville	1.7	5,000,000	----------	3,000,000	70	15	0–36
Total	----------	19,800,000	40,000	13,200,000	----------	----------	----------

Coal resources in Armstrong County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Plum Creek Township							Area 43.5 square miles
U. Freeport	35.6	133,500,000	400,000	101,800,000	90	15	30–48
L. Freeport	31.8	120,600,000	----------	82,000,000	80	15	0–58
U. Kittanning	.4	1,500,000	----------	900,000	70	15	0–48
L. Kittanning	41.6	120,200,000	----------	71,500,000	70	15	24–36
Total	----------	375,800,000	400,000	256,200,000	----------	----------	----------
Rayburn Township							Area 13.4 square miles
U. Freeport	5.7	21,100,000	3,200,000	13,600,000	90	15	30–48
L. Freeport	4.7	15,400,000	----------	10,400,000	80	15	0–86
L. Kittanning	9.1	25,200,000	1,300,000	16,200,000	80	15	30–36
Total	----------	61,700,000	4,500,000	40,200,000	----------	----------	----------
Redbank Township							Area 35.8 square miles
U. Freeport	3.0	11,500,000	300,000	8,500,000	90	15	40–48
L. Freeport	3.7	13,000,000	500,000	7,400,000	70	15	0–54
U. Kittanning	.6	2,200,000	----------	1,300,000	70	15	0–144
L. Kittanning	15.8	45,900,000	300,000	31,000,000	80	15	24–40
Brookville	3.3	8,900,000	----------	5,200,000	70	15	0–30
Total	----------	81,500,000	1,100,000	53,400,000	----------	----------	----------
South Bend Township							Area 22.8 square miles
Pittsburgh	1.4	7,200,000	5,000,000	1,700,000	90	15	58–94
U. Freeport	18.0	68,400,000	300,000	52,000,000	90	15	30–46
L. Freeport	7.1	24,400,000	----------	16,500,000	80	15	0–52
L. Kittanning	6.0	15,300,000	----------	9,100,000	70	15	24–32
Total	----------	115,300,000	5,300,000	79,300,000	----------	----------	----------
South Buffalo Township							Area 30.0 square miles
U. Freeport	19.3	63,000,000	1,300,000	47,200,000	90	15	24–42
L. Freeport	.6	1,600,000	----------	1,000,000	80	15	0–48
L. Kittanning	30.0	98,100,000	----------	58,300,000	70	15	36–44
Total	----------	162,700,000	1,300,000	106,500,000	----------	----------	----------
Sugar Creek Township							Area 27.1 square miles
U. Freeport	13.7	51,700,000	----------	39,500,000	90	15	18–50
U. Kittanning	1.6	5,500,000	----------	3,200,000	70	15	0–60
L. Kittanning	23.6	97,200,000	----------	66,000,000	80	15	36–48
Total	----------	154,400,000	----------	108,700,000	----------	----------	----------
Valley Township							Area 15.0 square miles
U. Freeport	7.0	24,500,000	----------	18,700,000	90	15	24–48
L. Freeport	7.8	23,100,000	----------	13,700,000	70	15	0–36
U. Kittanning	1.0	4,000,000	----------	2,300,000	70	15	0–48
L. Kittanning	9.5	29,000,000	----------	17,200,000	70	15	30–48
Total	----------	80,600,000	----------	51,900,000	----------	----------	----------

Coal resources in Armstrong County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Washington Township							Area 23.2 square miles
U. Freeport	1.4	5,400,000	----------	4,100,000	90	15	0-48
L. Freeport	1.6	5,300,000	----------	3,100,000	70	15	0-48
U. Kittanning	2.3	8,200,000	400,000	4,600,000	70	15	0-60
L. Kittanning	11.1	45,300,000	700,000	34,100,000	90	15	40-50
Total	----------	64,200,000	1,100,000	45,900,000	----------	----------	----------
Wayne Township							Area 46.4 square miles
U. Freeport	15.9	63,900,000	----------	48,800,000	90	J5	42-52
L. Freeport	14.0	43,100,000	----------	25,600,000	70	15	0-36
U. Kittanning	8.0	21,600,000	----------	12,800,000	70	15	0-60
L. Kittanning	34.3	108,600,000	----------	64,600,000	70	15	0-48
Brookville	23.0	67,500,000	10,000	34,000,000	60	15	0-72
Total	----------	304,700,000	10,000	185,800,000	----------	----------	----------
West Franklin Township							Area 26.9 square miles
U. Freeport	3.9	13,000,000	300,000	9,700,000	90	15	38-50
L. Freeport	4.4	19,000,000	----------	11,300,000	70	15	0-48
U. Kittanning	.6	2,300,000	----------	1,300,000	70	15	0-60
L. Kittanning	14.4	44,000,000	300,000	29,700,000	80	15	24-44
Total	----------	78,300,000	600,000	52,000,000	----------	----------	----------

BEAVER COUNTY

By
James D. Sisler

INTRODUCTION

Beaver County is a small producer of bituminous coal. The coal beds occur with clays which are valuable. Clay mining is one of the largest industries of the county. In numerous places where clay is mined the overlying coal is also recovered. The coal beds vary much in thickness and quality, and their mineable areas are not persistent.

The mineable coal beds occur entirely within the Allegheny group with the exception of a small area of Pittsburgh coal in the southeastern part of the county which occurs in the Monongahela group. The occurrence of the coal beds has been discussed at length in Bituminous Coal Fields of Pennsylvania, Part II.

COAL BEDS

Beaver County has three coal beds that are of value as shipping coals at the present time. They are the Lower Kittanning, Middle Kittanning, and Upper Freeport. The Pittsburgh bed has been mined almost entirely for local use.

Brookville coal. The Brookville has a limited outcrop in Beaver County. It is mined at only a few points, and this fuel is used locally. In most of the county the coal is either below drainage or covered with glacial drift.

Lower Kittanning coal. This bed is the best commercial bed in the county. Almost four million tons of coal have been mined from this bed, principally in conjunction with clay mining. It ranks first as a commercial coal and also first in recoverable tonnage.

The Lower Kittanning has a maximum thickness of 3 feet 4 inches in Beaver County. It averages approximately 2 feet. It is lenticular and high in sulphur, particularly so east of Beaver River. On Raccoon Creek the bed ranges from 2 feet to 2 feet 3 inches thick. It contains rather thick and numerous shale and bone partings. Westward along Ohio River these same characteristics are present. East of Ohio and Beaver rivers the Lower Kittanning, ranges from 12 inches to 2 feet 6 inches thick and is usually clean.

In the vicinity of Beaver Falls the coal averages 2 feet 6 inches thick and is usually clean, with the exception of a local parting 1 inch thick near the top. This is characteristic of the bed in the townships bordering Beaver River. In South Beaver Township the coal has a maximum thickness of 3 feet 4 inches, but the average is much less. The Lower Kittanning is thin in Darlington township.

Middle Kittanning coal. This bed has been mined to a very small extent in Beaver County. It stands third in size of reserve and fourth in prominence as a producer.

In Greene Township the Middle Kittanning ranges from 12 inches to 2 feet 6 inches thick. It is clean. In Moon and Dougherty townships it is either thin or entirely absent. In the vicinity of Beaver Falls in Brighton Township it is also extremely thin. In Industry Township it averages 15 inches thick, and in Dougherty 13 inches. In North Sewickley Township it varies much in thickness and physical character. In Big Beaver Township the coal is locally of mineable thickness, averaging 2 feet 6 inches. In the other townships of Beaver County its occurrence is very sporadic.

Lower Freeport coal. The Lower Freeport is thin in Beaver County, averaging less than 15 inches thick. Although it is locally much thicker it is lacking in many localities. It is bony and impure where thickest. In Greene Township the coal locally averages 3 feet thick and is entirely clean. The same thickness is present locally in Beaver Township. In Patterson Township the coal averages 2 feet 7 inches thick in an extensive area and is entirely clean. Opposite Beaver Falls the bed is an impure cannel 4 feet thick. On Blockhouse, McKinley, Brady, and Two Mile runs, Raccoon Creek, Island Run, and Brush Run, the coal is good and regular in thickness, ranging from 12 inches to 2 feet 6 inches thick.

The Lower Freeport has not been mined commercially in the county. It is fourth in size of reserve.

Upper Freeport coal. The Upper Freeport is the most important coal in the county although it is more irregular and lenticular here than in adjoining counties. It is not persistent and ranges from 6 inches to 5 feet thick. Where thickest it has 6 to 8 inches of impure shaly top coal, and the main bench of good coal is 2 feet 5 inches to 3 feet thick. In the northern part of the county it is 4 to 5 feet thick. The Upper Freeport has been mined extensively in the western part of Beaver County and shipped as a gas coal. It has a persistent thickness of 4 feet 6 inches and is divided into 4 benches by thin shale partings. South of Ohio River and east of Raccoon Creek the coal is locally thick but is parted with much shale and bone. The Upper Freeport is lenticular south of Ohio River and west of Raccoon Creek, ranging from 16 inches to nearly 7 feet thick. It as usual contains numerous binders and partings.

The greatest thickness of the Upper Freeport is on Jordan Run, Big Beaver Township, where the bed locally averages 7 feet 6 inches thick and is entirely clean. In North Sewickley Township in the vicinity of Thompson Run mines the bed is 4 feet 6 inches thick. The coal is of good quality and the partings are not troublesome. In Chippewa Township in the vicinity of Darlington the Upper Freeport ranges from 3 feet 4 inches to 5 feet 6 inches thick.

In Greene, South Beaver, and Ohio townships the coal seems to be persistent with a thickness of 3 feet 4 inches. The Upper Freeport is second in importance as a commercial coal and second also in quantity recoverable.

Pittsburgh coal. The Pittsburgh bed occurs only in Hanover and Independence townships. It averages 5 feet thick and is excellent coal where it has sufficient cover to protect it. Practically all of the coal from this bed has been used locally. Its value as a commercial producer is small although three million tons remain to be recovered.

The Clarion and the Upper Kittanning have such small value that they have not been considered as a resource for future mining.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the following order: Lower Kittanning, Upper Freeport, Pittsburgh, Middle Kittanning, Lower Freeport and Brookville.

Coal resources in Beaver County.

Bed	Original deposit	Mined out and lost	Recoverable
Pittsburgh	6,210,000	1,800,000	3,087,000
Upper Freeport	319,222,000	2,000,000	171,511,000
Lower Freeport	107,030,000		53,515,000
Middle Kittanning	238,464,000	300,000	123,213,000
Lower Kittanning	526,071,000	3,550,000	267,791,000
Brookville	64,800,000		32,400,000
Total	1,261,797,000	7,650,000	651,517,000

Summary of recoverable coal in Beaver County.

Township or Boro.*	Brookville	Lower Kittanning	Middle Kittanning	Lower Freeport	Upper Freeport	Pittsburgh
Big Beaver	2,592,000	8,180,000		2,025,000	802,000	
Brighton Boro	7,380,000	14,600,000		8,748,000	3,321,000	
Chippewa	3,402,000	15,252,000		6,966,000	2,761,000	
Darlington		12,680,000	10,692,000	2,260,000	5,199,000	
Daugherty		4,998,000	2,106,000	4,536,000	2,989,000	
Economy		14,750,000			5,978,000	
Franklin		8,068,000	1,620,000	2,592,000	8,748,000	
Greene		19,840,000	21,630,000		26,509,000	
Hanover		27,000,000	22,140,000		24,381,000	2,881,000
Harmony		3,143,000			1,312,000	
Hopewell		12,730,000	4,990,000		9,504,000	206,000
Industry	3,240,000	7,068,000	2,916,000	3,321,000	6,290,000	
Independence		14,216,000	8,100,000		13,487,000	
Marion		4,133,000	1,782,000	3,726,000	599,000	
Moon	1,863,000	10,750,000	3,402,000	2,532,000	5,994,000	
New Sewickley		30,984,000	4,140,000	8,262,000	5,176,000	
North Sewickley	6,660,000	7,407,000	2,916,000	2,835,000	695,000	
Ohio		16,689,000	18,275,000		22,994,000	
Patterson Hgts.		875,000				
Pulaski	3,726,000	778,000		1,782,000		
Raccoon	3,537,000	16,150,000	10,890,000		16,750,000	
Rochester		729,000			972,000	
South Beaver		16,780,000	7,614,000	3,870,000	7,260,000	
Total	32,400,000	267,791,000	123,213,000	53,515,000	171,511,000	3,087,000

*Townships organized since topographic map was made; Center from part of Moon township, Potter from parts of Moon and Raccoon townships

Coal resources in Beaver County by townships

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Big Beaver Township				Area 17.64 square miles		
Brookville	3.2	5,184,000		2,592,000	50	18
Lower Kittanning	9.2	16,560,000	200,000	8,180,000	50	20
Lower Freeport	2.5	4,050,000		2,025,000	50	18
Upper Freeport	1.1	1,782,000		802,000	45	18
Total		27,576,000	200,000	13,599,000		
Brighton Township				Area 22.56 square miles		
Brookville	8.2	14,760,000		7,380,000	50	20
Lower Kittanning	15.0	29,700,000	500,000	14,600,000	50	22
Lower Freeport	10.8	17,496,000		8,748,000	50	18
Upper Freeport	4.1	7,380,000		3,321,000	45	20
Total		69,336,000	500,000	34,049,000		
Chippewa Township				Area 17.68 square miles		
Brookville	4.2	6,804,000		3,402,000	50	18
Lower Kittanning	12.0	25,920,000	500,000	15,252,000	60	24
Lower Freeport	8.6	13,932,000		6,966,000	50	18
Upper Freeport	3.2	6,336,000	200,000	2,761,000	45	22
Total		52,992,000	700,000	28,381,000		

Coal resources in Beaver County by townships—Continued

Bed	Work-able Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recover-able	Average thickness (inches)
Darlington Township						Area 21.40 square miles
Lower Kittanning	13.2	25,760,000	400,000	12,680,000	50	20
Middle Kittanning	13.2	21,384,000		10,692,000	50	18
Lower Freeport	3.1	4,520,000		2,260,000	50	18
Upper Freeport	4.7	10,152,000	700,000	5,199,000	55	24
Total		61,816,000	1,100,000	30,831,000		
Daugherty Township						Area 11.20 square miles
Lower Kittanning	5.2	10,296,000	300,000	4,998,000	50	22
Middle Kittanning	2.6	4,212,000		2,106,000	50	18
Lower Freeport	5.6	9,072,000		4,536,000	50	18
Upper Freeport	4.1	6,642,000		2,989,000	50	18
Total		30,222,000	300,000	14,629,000		
Economy Township						Area 21.90 square miles
Lower Kittanning	15.0	29,700,000	200,000	14,750,000	50	22
Upper Freeport	8.2	13,284,000		5,978,000	45	18
Total		42,984,000	200,000	20,728,000		
Franklin Township						Area 17.20 square miles
Lower Kittanning	8.2	16,236,000	100,000	8,068,000	50	22
Middle Kittanning	2.0	3,240,000		1,620,000	50	18
Lower Freeport	3.2	5,184,000		2,592,000	50	18
Upper Freeport	1.2	1,944,000		8,748,000	45	18
Total		26,604,000	100,000	21,028,000		
Greene Township						Area 27.65 square miles
Lower Kittanning	22.1	39,780,000	100,000	19,840,000	50	20
Middle Kittanning	18.3	39,528,000	200,000	21,630,000	55	24
Upper Freeport	17.4	43,848,000		26,309,000	60	28
Total		123,156,000	300,000	67,779,000		
Hanover Township						Area 42.88 square miles
Lower Kittanning	30.0	54,000,000		27,000,000	50	20
Middle Kittanning	24.6	44,280,000		22,140,000	50	20
Lower Freeport						
Upper Freeport	30.1	54,180,000		24,381,000	45	20
Pittsburgh	1.04	5,616,000	1,500,000	2,881,000	70	60
Total		158,076,000	1,500,000	76,402,000		
Harmony Township						Area 4.49 square miles
Lower Kittanning	3.2	6,336,000	50,000	3,143,000	50	22
Upper Freeport	1.8	2,916,000		1,312,000	45	18
Total		9,252,000	50,000	4,455,000		

Coal resources in Beaver County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Hopewell Township						Area 21.48 square miles
Lower Kittanning	14.2	25,560,000	100,000	12,730,000	50	20
Middle Kittanning	4.2	9,072,000	----------	4,990,000	55	24
Upper Freeport	10.1	20,008,000	100,000	9,504,000	50	22
Pittsburgh	.11	594,000	300,000	206,000	70	60
Total	----------	55,234,000	500,000	27,430,000	----------	----------
Industry Township						Area 10.7 square miles
Brookville	3.6	6,480,000	----------	3,240,000	50	20
Lower Kittanning	5.5	11,880,000	100,000	7,068,000	60	24
Middle Kittanning	3.6	5,832,000	----------	2,916,000	50	18
Lower Freeport	4.1	6,642,000	----------	3,321,000	50	18
Upper Freeport	4.2	10,584,000	100,000	6,290,000	60	28
Total	----------	41,418,000	200,000	22,935,000	----------	----------
Independence Township						Area 24.75 square miles
Lower Kittanning	19.5	31,590,000	----------	14,216,000	45	18
Middle Kittanning	10.0	16,200,000	----------	8,100,000	50	18
Upper Freeport	18.5	29,970,000	----------	13,487,000	45	18
Total	----------	77,760,000	----------	35,803,000	----------	----------
Marion Township						Area 8.84 square miles
Lower Kittanning	4.2	8,316,000	50,000	4,133,000	50	22
Middle Kittanning	2.2	3,564,000	----------	1,782,000	50	18
Lower Freeport	4.6	7,452,000	----------	3,726,000	50	18
Upper Freeport	.8	1,332,000	----------	599,000	45	18
Total	----------	20,664,000	50,000	10,230,000	----------	----------
Moon Township						Area 20.76 square miles
Brookville	2.3	3,726,000	----------	1,863,000	50	18
Lower Kittanning	12.0	21,600,000	100,000	10,750,000	50	20
Middle Kittanning	4.2	6,804,000	----------	3,402,000	50	18
Lower Freeport	3.2	5,184,000	----------	2,592,000	50	18
Upper Freeport	7.4	13,320,000	----------	5,994,000	45	20
Total	----------	50,634,000	100,000	24,601,000	----------	----------
New Sewickley Township						Area 33.05 square miles
Lower Kittanning	24.0	51,840,000	200,000	30,984,000	60	24
Middle Kittanning	4.6	8,280,000	----------	4,140,000	50	20
Lower Freeport	10.2	16,524,000	----------	8,262,000	50	18
Upper Freeport	7.1	11,502,000	----------	5,176,000	45	18
Total	----------	88,146,000	200,000	48,562,000	----------	----------

Coal resources in Beaver County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
North Sewickley Township						Area 19.32 square miles
Brookville	7.4	13,320,000	------	6,660,000	50	20
Lower Kittanning	9.2	16,560,000	100,000	7,407,000	45	20
Middle Kittanning	3.6	5,832,000	------	2,916,000	50	18
Lower Freeport	3.5	5,670,000	------	2,835,000	50	18
Upper Freeport	1.2	1,944,000	400,000	695,000	45	18
Total	------	43,326,000	500,000	20,513,000	------	------
Ohio Township						Area 23.60 square miles
Lower Kittanning	17.0	33,660,000	300,000	16,680,000	50	22
Middle Kittanning	14.2	33,228,000	100,000	18,275,000	55	26
Upper Freeport	10.2	33,048,000	200,000	22,994,000	70	36
Total	------	99,936,000	600,000	57,949,000	------	------
Patterson Heights Boro (including Beaver Falls Boro)						Area 2.04 square miles
Lower Kittanning	1.0	1,800,000	50,000	875,000	50	20
Total	------	1,800,000	50,000	875,000	------	------
Pulaski Township (including New Brighton Boro)						Area 4.0 square miles
Brookville	4.6	7,452,000	------	3,726,000	50	18
Lower Kittanning	0.6	1,297,000	------	778,000	60	24
Lower Freeport	2.2	3,564,000	------	1,782,000	50	18
Total	------	12,313,000	------	6,286,000	------	------
Raccoon Township						Area 25.14 square miles
Brookville	4.2	7,074,000	------	3,537,000	50	18
Lower Kittanning	18.0	32,400,000	100,000	16,150,000	50	20
Middle Kittanning	12.1	21,780,000	------	10,890,000	50	20
Upper Freeport	14.1	30,456,000	------	16,750,000	55	24
Total	------	91,710,000	100,000	47,327,000	------	------
Rochester Township (including Rochester Boro.)						Area 3.7 square miles
Lower Kittanning	1.0	1,620,000	------	729,000	45	18
Upper Freeport	1.0	2,160,000	------	972,000	45	24
Total	------	3,780,000	------	1,701,000	------	------
South Beaver Township						Area 26.08 square miles
Lower Kittanning	17.0	33,660,000	100,000	16,780,000	50	22
Middle Kittanning	9.4	15,228,000	------	7,614,000	50	18
Lower Freeport	4.3	7,740,000	------	3,870,000	50	20
Upper Freeport	8.3	16,434,000	300,000	7,260,000	45	22
Total	------	73,062,000	400,000	35,524,000	------	------

BLAIR COUNTY

By
James D. Sisler

INTRODUCTION

The coal-bearing rocks are confined to a small area on the crest of Allegheny Mountain in the western part of Blair County, and a small isolated area, four miles north of Tipton Station in Antis Township. The coal beds are in the Allegheny group, and are, in ascending geological order, the Brookville, Clarion, Lower, Middle and Upper Kittanning, and the Lower and Upper Freeport. The Lower Kittanning is the chief commercial bed in Blair County. As the coal area of the county is small, it was not considered necessary to compute the resources by townships.

COAL BEDS

The Brookville coal is mined only in Logan Township, where it averages 3 feet 8 inches thick. Usually it occurs in two benches separated by a 1-inch shale parting 11 inches below the top. The bottom bench averages 2 feet 8 inches thick. The Clarion coal, which is seldom more than 12 inches thick, is not considered of future importance and was not included in the calculation of coal resources.

The Lower Kittanning is the chief commercial bed of the county; approximately 16,300,000 tons of this bed have been mined out. It has been used with much success for coking at Bennington. In Logan Township the Lower Kittanning averages 2 feet 6 inches thick and is mined commercially near Buckhorn and Glenwhite. In Allegheny Township the Lower Kittanning is 3 feet 3 inches thick including a 2-inch shale parting five inches above the bottom.

The Middle Kittanning, Upper Kittanning, and Lower Freeport coals do not have much future commercial value. In fact, the Middle Kittanning has not been computed as a resource for the small quantity of coal contained in the bed will be ruined by mining the Lower Kittanning beneath it. The Upper Kittanning and Lower Freeport coals average only 12 inches thick.

The Upper Freeport is the thickest and most persistent bed in Blair County. Its area is restricted to Allegheny Township. It is mined commercially in the vicinity of Bennington and southeast of Gallitzin. It averages 4 feet 4 inches thick and occurs in two or three benches, separated by shale partings ½ to 3 inches thick.

The coals in the isolated area in Antis Township have hardly more than a geologic interest. They belong to the Allegheny group, and owe their existence to a fault. Movement has much disturbed them and mining is hazardous. Their value is for local fuel only.

COAL RESOURCES

The computation of the resources of coal in the Lower Kittanning and Upper Freeport beds is very accurate. The computation of the remaining beds is less accurate because little is known concerning their outcrops and physical character.

The Upper Freeport, Lower Freeport and Upper Kittanning are fifty per cent mineable. The Brookville and Lower Kittanning are seventy per cent mineable.

Coal resources of Blair County

Bed	Workable area (square miles)	Original deposit	Mined out and lost	Recoverable
U. Freeport	1.6	6,912,000	2,400,000	2,256,000
L. Freeport	1.8	1,944,000	----------------	972,000
U. Kittanning	2.0	2,160,000	----------------	1,080,000
L. Kittanning	6.0	24,300,000	16,300,000	5,600,000
Brookville	10.0	43,200,000	5,200,000	26,600,000
Total		78,516,000	23,900,000	36,508,000

BRADFORD COUNTY

By
James D. Sisler

INTRODUCTION

The coal-bearing rocks of Bradford County are confined to the Barclay Basin in Barclay and Leroy townships. There were originally 30,000 acres in the field, which contains the Lower Kittanning and Brookville coals. Production is small and at the present time none of the mines are working.

COAL BEDS

Brookville coal. This bed is from 12 inches to 3 feet 6 inches thick, and has not been worked on a commercial scale. It is locally known as the "Three foot" coal.

Lower Kittanning coal. This is the most important coal, and has yielded nearly the total production. It is not being worked at present, but has long been famous for its excellent heating properties. It is locally known as the "Big vein."

The Lower Kittanning is generally a triple bed, consisting of three benches of coal, separated by shale partings, ranging from 2 to 8 inches thick. The lower bench ranges from 10 inches to 3 feet thick, and is friable, columnar in structure, and deep black in color. The middle bench ranges from 4 to 18 inches thick and is also soft and friable. The top bench ranges from 16 inches to 2 feet thick and is harder.

COAL RESOURCES

The following table summarizes the coal resources of Bradford County. Only the coal in the Barclay Basin has been computed. A few thousand tons of coal contained in the extension of the Blossburg district, have been included in the Tioga County computations.

The Lower Kittanning is 60 per cent mineable and the Brookville 50 per cent. The computations are very accurate because many detailed measurements were available.

Coal resources in Bradford County

	Workable area (sq. mi.)	Original deposit	Mined out and lost	Recoverable
Lower Kittanning	4	19,440,000	14,000,000	3,264,000
Brookville	9	25,000,000	500,000	12,250,000
Total		44,440,000	14,500,000	15,514,000

BROAD TOP COAL FIELD

By
James D. Sisler

INTRODUCTION

The Broad Top coal field lies in the south central part of the State in Bedford, Fulton, and Huntingdon counties. It is east of Allegheny Mountain and isolated from the main bituminous coal field. The coal is semi-bituminous. The output of the Broad Top field goes to eastern markets and is largely consumed for domestic fuel.

The coal-bearing rocks in this field lie in a broad basin which has been folded into numerous sub-basins running in a general northeast-southwest direction, and parallel to the larger mountain ridges and valleys of this section of Pennsylvania. A portion of the Conemaugh group and the entire Allegheny group are present in this coal area. The Allegheny group contains all the merchantable coals and has an irregular outcrop along and in a series of synclinal folds. This group contains seven or more coal beds, three of which are of great commercial importance, and one or more may have future commercial value.

COAL BEDS

Gordon coal. The Gordon coal at the base of the Allegheny group is irregular in thickness and quality. It has been mined at one or two places for local use, but its average thickness is less than 18 inches. It is, therefore, not computed as a resource.

Fulton coal. The Fulton bed, lying 20 feet above the Gordon, varies from 3 to 6 inches thick and averages over 4 feet. It usually contains at least one parting of bituminous shale. The Fulton bed has been mined extensively on Shoups Run and in the eastern Broad Top basin. Its development is beginning in the southern part of the field. The Fulton is persistent in thickness wherever it is being mined. The Fulton had the largest original deposit. Nine million tons of coal have been mined out and lost, leaving a recoverable tonnage in this bed of 134 million tons, the largest recoverable tonnage of any bed in the district. The Fulton averages 68 per cent recoverable.

Barnett coal. This bed, lying 50 feet above the Gordon and some 30 feet above the Fulton is also an important bed in this coal area. It ranges from 3 to 4 feet thick. It is usually quite free from large partings and is persistent in thickness. The Barnett bed, like the Fulton, has been mined more extensively on Shoups Run and in the East Broad Top basin than elsewhere. It is also mined to some extent on Six Mile, Long, and Sandy runs, and at many localities in Broad Top Township, Bedford County. The Barnett bed is second in size of original and recoverable tonnage. 66 per cent of the bed is recoverable.

Kelly coal. This bed, lying 270 feet above the Barnett, is also a persistent and valuable bed, ranging from 3 to 5 feet thick. It has been mined extensively and is now practically half mined out. Mining has been extensive in this bed because of its easy accessibility. Its quality is excellent, although it contains two or more shale partings. One of the partings often thickens up to 3 feet or more. In this instance the lower bench is not mined. The Kelly has the smallest area of workable coal in the Broad Top area. Less recoverable coal remains in this bed than any other bed in the district.

Numerous other beds in this district have not been computed as resources because their physical character will make mining extremely hazardous.

COAL RESOURCES

The calculation of coal resources in this area is very accurate because much information is available. The following tables present the coal resources of the area by townships:

Coal resources in the Broad Top field

Bed	Original deposit	Mined out and lost	Recoverable
Kelly (U. Freeport)	71,712,000	17,100,000	38,175,000
Barnett (L. Kittanning)	137,394,000	15,650,000	80,749,000
Fulton (Clarion)	205,848,000	9,100,000	133,994,000
Total	414,954,000	41,850,000	252,918,000

Summary of recoverable coal in Broad Top coal field

Township	Fulton	Barnett	Kelly
Broad Top	76,228,000	48,919,000	33,888,000
Carbon	33,982,000	17,655,000	3,598,000
Todd	1,155,000	385,000	
Wells	12,172,000	7,725,000	
Wood	10,457,000	6,065,000	689,000
Total	133,994,000	80,749,000	38,175,000

Coal resources in Broad Top Field by townships

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Broad Top Township					Area 48.20 square miles	
Fulton	25.8	116,100,000	4,000,000	76,228,000	68	50
Barnett	25.5	82,620,000	8,500,000	48,919,000	66	36
Kelly	14.1	60,912,000	12,500,000	33,888,000	70	48
Total		259,632,000	25,000,000	159,035,000		
Carbon Township, including Broad Top City					Area 19.17 square miles	
Fulton	11.5	51,750,000	2,500,000	33,982,000	69	50
Barnett	9.2	31,464,000	5,500,000	17,655,000	68	38
Kelly	2.0	8,640,000	3,500,000	3,598,000	70	48
Total		91,854,000	11,500,000	55,235,000		
Todd Township					Area 40.92 square miles	
Fulton	.7	3,150,000	1,500,000	1,155,000	70	50
Barnett	.2	684,000	100,000	385,000	66	38
Total		3,834,000	1,600,000	1,540,000		
Wells Township					Area 30.52 square miles	
Fulton	4.0	18,000,000	100,000	12,172,000	68	50
Barnett	3.1	12,186,000	300,000	7,725,000	65	34
Total		30,186,000	400,000	19,897,000		
Wood Township					Area 15.33 square miles	
Fulton	3.9	16,848,000	1,000,000	10,457,000	66	48
Barnett	2.9	10,440,000	1,250,000	6,065,000	66	40
Kelly	.6	2,160,000	1,100,000	689,000	65	40
Total		29,448,000	3,350,000	17,211,000		

BUTLER COUNTY

By
James D. Sisler

INTRODUCTION

Butler County is not one of Pennsylvania's largest coal-producing counties. This county contains much reserve coal, but the beds in the main are thinner than those in adjoining counties. The prominence of the Pittsburgh and thick Freeport beds in Allegheny County have hindered the production of Butler County coals. After these thick beds have been completely exploited Butler County will produce much coal. The coals of Butler County as a rule are rather high in ash and sulphur and cannot compete, when competition is keen, with nearby coals of better grade.

The mineable coal beds occur entirely within the Allegheny group and are widely distributed throughout the entire county. The thick Freeport bed which has enjoyed much prominence in the last few years underlies a large acreage in the southeastern part of the county.

COAL BEDS

Although ten coal beds in Butler County, are locally of workable thickness, only seven have been calculated as coal resources. The other three are so restricted in area and variable in thickness that their future value is very slight. The Brookville bed contained originally a million and a half tons of coal. Almost a million tons remain in the ground. The Upper Kittanning is second in size of resource and contains 342,817,000 tons. The Lower Kittanning and Upper Freeport each contain approximately 250,000,000 tons of recoverable coal.

Brookville coal. This bed has been mined extensively in the northern part of the county. In the vicinity of Deegan, Venango Township, this bed averages 3 feet 1 inch thick and is of very good quality. At Keenan the Brookville is variable in physical character, but much good coal is available at this locality. The same condition is true at Ferris where the coal is 4 feet thick. The Brookville is present at a few localities in Allegheny Township. Where thickest it is divided into three benches by two bone and pyrite partings ranging from 1 to 2 inches thick. The top bench averages 11 inches

thick, the middle 1 foot 11 inches, and the bottom 2 feet thick. Where thinnest the bed occurs in two benches. The top bench is 8 inches thick and the bottom bench 2 feet 4 inches thick, separated by a shale parting ½ inch thick.

There is one commercial mine in the Brookville in Cherry Township in the vicinity of Nelsons Bridge. Here the bed is 2 feet 1 inch thick and contains a few thin partings. One of the principal mining districts of the Brookville is in the vicinity of Hilliards and Argentine. The bed is 3 feet 8 inches thick at Argentine, including a 1-inch bone parting 9 inches from the top. At Hilliards the coal ranges from 2 feet 10 inches to 3 feet 8 inches thick. It is usually clean but where thickest a 2-inch bone parting is present a few inches above bottom. At Erico Station the bed ranges from 3 feet 10 inches to 4 feet 4 inches thick and has a ½-inch parting 9 inches from the top. At Goff Station the Brookville is 4 feet 6 inches thick including the characteristic bone parting.

Very little is known of its thickness and character in the southern part of Butler County where it is deep under cover. It is known, however, that wells drilled for oil and gas have penetrated this bed at numerous points and have found that it is of mineable thickness.

The Brookville coal is high in volatile matter and very high in ash and sulphur. A good product can be shipped if the coal is carefully cleaned. The Brookville coal is first in size of original deposit and also first in quantity of coal recoverable.

Clarion coal. This coal is mined commercially at only one locality in the county. In the mine at Bruin it ranges from 3 feet 10 inches to 7 feet thick and is separated into two or more benches by shale partings ranging from 6 to 8 inches thick. The bed is also of mineable thickness in other townships within the county, but little attention has been paid to it. In Parker and Allegheny townships the Clarion is of mineable thickness. At Bonus the coal averages 3 feet 4 inches thick including 2 inches of shale 11 inches below the top. At Stonehouse the coal is 3 feet 4 inches, including a thin bone parting 16 inches below the top. At Parkers Landing the Clarion is 3 feet 6 inches thick, including a thin parting of bone 8 inches from the top. West of Foxburg, Allegheny Township, the coal is much parted by shale. This characteristic is common in this and adjoining townships. Little is known of the physical and chemical character of the Clarion coal in the townships of southern Butler County. The Clarion has the smallest resource of recoverable coal in the county.

Lower Kittanning coal. The Lower Kittanning coal is important only in a few eastern townships where it is very regular in thickness and physical character. The coal is clean and has excellent quality. It is being mined in the vicinity or Barber, Worth Town-

ship, where it is clean and averages 2 feet 10 inches thick. In Brady Township, particularly in the vicinity of Osle, it is 3 feet 1 inch thick and entirely clean. The same character is persistent on Muddy Creek.

The Lower Kittanning is mined along with its underclay, in Clay Township. In the vicinity of Claytonia it is 3 feet 1 inch thick. The average thickness of the bed in this township is probably 2 feet 10 inches.

In the vicinity of Portersville in Muddy Creek Township the bed is 3 feet 4 inches thick and clean. In Center Township a persistent 8 inch bone parting makes its appearance 10 inches below the top. The bed averages 3 feet 7 inches thick including this bone parting.

The Lower Kittanning is mined commercially at numerous points in Summit Township in the vicinity of North Butler. Here the bed is 2 feet 6 inches to 2 feet 8 inches thick. A commercial mine is working the Lower Kittanning in the vicinity of Wahlville in Forward Township. The bed is 2 feet 8 inches thick.

The Lower Kittanning, although it is of mineable thickness in the southern townships of Butler County, has not been touched because of the thick Freeport bed which is most important in this area.

The Lower Kittanning coal contains 233 million tons of reserve coal, much of which is in good mineable condition. Seven million tons have been mined out and lost.

Middle Kittanning coal. This bed is very persistent and clean in Butler County although it does not have such a great thickness. On the west branch of Big Buffalo Creek in Clearfield Township it is locally 4 feet 6 inches thick, including a shale parting 6 to 12 inches thick. The Middle Kittanning has its northern outcrop in Mercer Township and is mined by a few country banks in the vicinity of Harrisville. It averages 2 feet 8 inches thick, including a bone parting 1 inch thick near the top of the bed. This thickness is persistent throughout Marion and Venango townships, although locally bone and shale partings destroy the commercial possibilities of the bed. In the vicinity of Emlenton, Allegheny Township, the bed is 2 feet thick and clean. The Lower Kittanning increases in thickness southward, and in the vicinity of Bruin it is 4 feet 2 inches thick, including a persistent shale parting 2 inches thick.

The commercial value of the Middle Kittanning in Washington Township is extremely doubtful. Outcrops in Cherry Township indicate that it is locally mineable; the bed is 2 feet 7 inches thick, including a 2 inch shale parting near the bottom. The Middle Kittanning is being mined at Claytonia in Clay Township where it averages 3 feet thick. The same thickness was noticed in a mine at Nealeys Station on Big Run, Worth Township. One mine is work-

ing the Middle Kittanning in Muddy Creek Township. Here the coal is 3 feet 3 inches thick and comparatively clean. In southwestern Brady Township the coal averages 2 feet 9 inches thick.

The Middle Kittanning is under cover in the southeastern townships of Butler County. Oil and gas wells have shown that it is extremely variable in thickness. The Lower Kittanning will be mined out first, and what little value the Middle Kittanning might have may be destroyed by subsidence. The Middle Kittanning bed contains 250 million tons of recoverable coal. 1,250,000 tons have been mined out and lost, most of which came from the northern part of Butler County.

Upper Kittanning coal. This bed is being mined at numerous localities in Butler County. The northernmost mine is in the vicinity of Adams Corners, Slippery Rock Township. At this locality the coal ranges from 2 feet 4 inches to 2 feet 10 inches thick and is entirely clean. Numerous country banks are mining the Upper Kittanning in Cherry, Washington, and Fairview townships. The coal is extremely variable in thickness, ranging from a few inches to 5 feet thick. The Upper Kittanning is fairly persistent in thickness in Muddy Creek Township. It is being mined for local fuel and ranges from 2 feet to 3 feet 4 inches thick.

The Upper Kittanning has some commercial value in Center Township and is being mined on a commercial scale by four companies. At Jamisonville the coal is 3 feet 4 inches thick and is very clean. In a mine on Connoquenessing Creek the Upper Kittanning is 2 feet 6 inches thick, including a 1 inch bone parting 10 inches below the top. North of Butler City the coal is 2 feet 10 inches thick, including a thin bone parting. This thickness continues northward for some distance. At Oneida Station the coal is 2 feet 5 inches thick, including a thin bone parting. In Lancaster Township the coal has a maximum thickness of 3 feet 1 inch.

The Upper Kittanning outcrops in Connoquenessing Creek in Jackson Township. Outcrop measurements are exceedingly variable, and the coal appears to average slightly less than 3 feet thick. The Upper Kittanning originally contained 627 million tons. It has been the largest producer within the county; 7,450,000 tons of coal have been mined out and lost in this bed; 342,817,000 tons are recoverable.

Lower Freeport coal. This bed is persistently thin and rarely of mineable thickness. Although it contains 158 million tons of recoverable coal, this tonnage must come from coal less than 2 feet thick. Locally the coal is of good quality and of mineable thickness. Two miles north of Petrolia, Parker Township, the bed is 4 feet 5 inches thick. It is also of mineable thickness in the vicinity of Bonus,

Allegheny Township. A few country banks have mined the Lower Freeport for local fuel in Clay Township.

A commercial mine is working this bed at Harmony Junction, Jackson Township. Here the coal is 2 feet 10 inches thick. In other localities in Jackson Township the bed appears to be less valuable. The Lower Freeport is not being mined east of Jackson Township with the exception of Clearfield and Winfield townships. In Clearfield Township three commercial mines are working the Lower Freeport in the vicinity of Fenelton. Near this town the Lower Freeport averages 4 feet thick, including a rather thick shale parting.

The Lower Freeport is being mined in the vicinity of Cabot, Winfield Township. It averages 3 feet 1 inch thick and is a fairly good coal. Not much attention has been given to the Lower Freeport because of the better quality and thickness of the overlying Upper Freeport.

Upper Freeport coal. This bed has its principal mining importance in the eastern and southern townships of Butler County. In the western part of the county its thickness is very irregular, with a maximum of 2 feet and an average of much less.

The northernmost mines in the Upper Freeport bed are in Clay, Concord, and Fairview townships. In the vicinity of Queen Junction the Upper Freeport is 6 feet thick and entirely clean. This thickness does not persist in large areas, but the average thickness of the bed is over 4 feet. At West Sunbury the bed is 4 feet 7 inches thick, including 15 inches of bone coal at the bottom. In Concord Township the coal ranges from 2 feet 2 inches to 2 feet 10 inches thick and is very clean. In Fairview Township the coal is 2 feet 7 inches thick; in Center township 3 feet 10 inches. The Upper Freeport is being mined in the vicinity of Chicora, Donegal Township, where it averages 3 feet 5 inches thick and is entirely clean. In Connoquenessing Township where it appears to average 2 feet 6 inches thick it is being mined by farmers. It is being mined in Butler Township and is locally 3 feet 6 inches thick and entirely clean.

In Summit Township the Upper Freeport averages 2 feet 10 inches thick. Outcrops of the Upper Freeport are numerous in Winfield Township where it averages 3 feet 2 inches thick. It is not being mined commercially. In Penn and Forward townships the Upper Freeport averages 2 feet 6 inches thick, including 5 inches of cannel coal near the top of the bed.

The Upper Freeport is being mined in the vicinity of Evans City, Jackson Township, where it averages 3 feet 4 inches thick and is comparatively clean. Near the Beaver County line in Cranberry Township the coal is 3 feet 4 inches thick but contains approximately 8 inches of bone coal near the middle. The Upper Freeport

varies much in physical character in Adams Township, and averages less than 2 feet 6 inches thick. The bed increases in thickness in Clinton Township and is mined commercially.

The most important mining center of the Upper Freeport in Butler County is in Buffalo Township. This township is in the "Thick Freeport" area where the bed is usually divided into two benches by a shale parting 1 to 2 inches thick, 4 to 5 inches above the bottom. The bed averages over 3 feet thick and is clean and of excellent quality.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the following order: Upper Freeport, Upper Kittanning, Lower Freeport, Middle Kittanning, Lower Kittanning, Brookville, and Clarion.

Coal resources in Butler County

Bed	Original deposit	Mined out and lost	Recoverable
Upper Freeport	466,587,000	16,200,000	260,867,000
Lower Freeport	340,200,000	1,806,000	157,888,000
Upper Kittanning	627,539,000	7,450,000	342,817,000
Middle Kittanning	513,208,000	1,250,000	250,593,000
Lower Kittanning	483,423,000	7,200,000	233,562,000
Clarion	224,586,000	600,000	109,059,000
Brookville	1,499,264,000	4,800,000	902,725,000
Total	4,154,807,000	39,300,000	2,257,511,000

Summary of recoverable coal in Butler County

Township or Boro.	Brookville	Clarion	Lower Kittanning	Middle Kittanning	Upper Kittanning	Lower Freeport	Upper Freeport
Adams	25,920,000	10,611,000	8,128,000	9,234,000	15,958,000	6,772,000	12,177,000
Allegheny	25,883,000	10,318,000	2,462,000	4,811,000	1,737,000	5,022,000	----------
Brady	27,005,000	----------	10,234,000	6,882,000	1,067,000	364,000	3,999,000
Buffalo	27,086,000	----------	5,832,000	4,941,000	15,800,000	6,310,000	13,321,000
Butler	27,994,000	----------	9,377,000	9,144,000	12,503,000	5,978,000	11,418,000
Centre	30,186,000	----------	14,243,000	5,702,000	15,434,000	5,686,000	10,841,000
Cherry	18,990,000	5,184,000	8,817,000	9,145,000	1,051,000	----------	----------
Clay	23,008,000	2,673,000	11,380,000	7,371,000	8,482,000	2,770,000	6,555,000
Clearfield	23,918,000	----------	7,906,000	8,414,000	10,756,000	8,244,000	10,463,000
Clinton	28,080,000	----------	7,144,000	6,318,000	14,414,000	6,707,000	21,296,000
Concord	32,456,000	----------	4,203,000	5,508,000	13,872,000	2,260,000	4,050,000
Connoquenessing	30,011,000	----------	7,406,000	6,638,000	15,260,000	6,399,000	11,512,000
Cranberry	31,946,000	----------	6,804,000	10,764,000	12,312,000	6,002,000	11,405,000
Donegal	26,892,000	----------	3,418,000	5,508,000	19,626,000	7,217,000	15,873,000
Fairview	28,642,000	12,825,000	5,206,000	8,073,000	14,141,000	4,212,000	5,434,000
Franklin	29,722,000	----------	7,605,000	8,316,000	13,072,000	4,666,000	9,285,000
Forward	24,570,000	----------	10,636,000	8,424,000	15,800,000	8,316,000	12,161,000
Jackson	21,168,000	----------	6,059,000	6,853,000	17,566,000	5,717,000	14,846,000
Jefferson	29,835,000	----------	9,180,000	6,998,000	14,142,000	5,508,000	13,303,000
Lancaster	22,745,000	----------	5,524,000	10,062,000	11,532,000	4,933,000	9,346,000
Marion	35,848,000	7,938,000	7,650,000	8,658,000	----------	----------	----------
Mercer	15,233,000	6,300,000	3,928,000	3,955,000	----------	----------	----------
Muddy Creek	37,513,000	----------	10,551,000	7,344,000	9,194,000	3,402,000	4,324,000
Middlesex	28,431,000	----------	7,059,000	9,009,000	13,028,000	5,686,000	17,237,000
Oakland	27,302,000	----------	6,754,000	6,156,000	13,043,000	4,520,000	9,022,000
Parker	28,116,000	16,886,000	2,586,000	11,231,000	2,183,000	5,940,000	----------
Penn	31,968,000	----------	6,249,000	6,804,000	11,454,000	6,772,000	8,192,000
Slippery Rock	15,098,000	7,020,000	10,232,000	7,776,000	13,008,000	----------	----------
Summit	22,529,000	----------	8,996,000	5,882,000	13,179,000	5,751,000	12,248,000
Venango	36,403,000	11,160,000	2,547,000	5,994,000	2,547,000	6,579,000	----------
Washington	34,054,000	18,144,000	3,276,000	9,288,000	5,652,000	972,000	----------
Winfield	28,166,000	----------	6,415,000	6,804,000	14,167,000	11,392,000	9,973,000
Worth	26,017,000	----------	5,775,000	12,606,000	837,000	3,791,000	2,596,000
Total	902,725,000	109,059,000	233,562,000	250,593,000	342,817,000	157,888,000	260,867,000

Coal resources in Butler County by townships

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Adams Township						Area 24.02 square miles
Brookville	15.0	43,200,000	----------	25,920,000	60	32
Clarion	13.1	23,580,000	----------	10,611,000	45	20
Lower Kittanning	8.2	16,236,000	----------	8,118,000	50	22
Middle Kittanning	11.4	20,520,000	----------	9,231,000	45	20
Upper Kittanning	12.4	29,016,000	----------	15,958,000	55	26
Lower Freeport	8.8	15,048,000	----------	6,772,000	45	19
Upper Freeport	8.2	22,140,000	----------	12,177,000	55	30
Total		169,740,000	----------	88,860,000		
Allegheny Township						Area 24.28 square miles
Brookville	11.2	40,320,000	500,000	25,883,000	65	40
Clarion	7.2	20,736,000	100,000	10,318,000	50	32
Lower Kittanning	3.5	5,670,000	200,000	2,462,000	45	18
Middle Kittanning	5.4	10,692,000	----------	4,811,000	45	22
Upper Kittanning	2.0	3,960,000	100,000	1,737,000	45	22
Lower Freeport	3.1	10,044,000	----------	5,022,000	50	36
Upper Freeport	----------	----------	----------	----------	----------	----------
Total		91,422,000	900,000	50,233,000		
Brady Township						Area 21.32 square miles
Brookville	14.2	45,008,000	----------	27,005,000	60	36
Clarion	----------	----------	----------	----------	----------	----------
Lower Kittanning	6.2	17,856,000	800,000	10,234,000	60	32
Middle Kittanning	7.8	15,444,000	150,000	6,882,000	45	22
Upper Kittanning	1.0	2,340,000	400,000	1,067,000	55	26
Lower Freeport	.5	810,000	----------	364,000	45	18
Upper Freeport	2.1	8,370,000	100,000	3,999,000	55	30
Total		89,828,000	1,450,000	49,541,000		
Buffalo Township						Area 24.4 square miles
Brookville	14.4	49,248,000	----------	27,086,000	55	38
Clarion	----------	----------	----------	----------	----------	----------
Lower Kittanning	5.4	11,664,000	----------	5,832,000	50	24
Middle Kittanning	6.1	10,980,000	----------	4,941,000	45	20
Upper Kittanning	11.4	28,728,000	----------	15,800,000	55	28
Lower Freeport	8.2	14,022,000	----------	6,310,000	45	19
Upper Freeport	8.1	27,702,000	5,500,000	13,321,000	60	38
Total		142,344,000	5,500,000	73,290,000		
Butler Township						Area 24.78 square miles
Brookville	16.2	46,656,000	----------	27,994,000	60	32
Clarion	----------	----------	----------	----------	----------	----------
Lower Kittanning	7.8	18,954,000	200,000	9,377,000	50	27
Middle Kittanning	9.1	18,288,000	----------	9,144,000	50	23
Upper Kittanning	9.8	22,932,000	200,000	12,503,000	55	26
Lower Freeport	8.2	13,284,000	----------	5,978,000	45	18
Upper Freeport	7.8	21,000,000	300,000	11,418,000	55	30
Total		141,174,000	700,000	76,414,000		

Coal resources in Butler County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Center Township				Area 23.98 square miles		
Brookville	17.2	46,440,000	------	30,186,000	65	30
Clarion	------	------	------	------	------	------
Lower Kittanning	9.2	26,496,000	600,000	14,243,000	55	32
Middle Kittanning	6.4	12,672,000	------	5,702,000	45	22
Upper Kittanning	9.8	28,224,000	2,500,000	15,434,000	60	32
Lower Freeport	7.8	12,636,000	------	5,686,000	45	18
Upper Freeport	5.4	18,468,000	400,000	10,841,000	60	38
Total		144,936,000	3,500,000	82,092,000		
Cherry Township				Area 25.18 square miles		
Brookville	14.2	31,950,000	300,000	18,990,000	60	25
Clarion	4.0	11,520,000	------	5,184,000	45	28
Lower Kittanning	7.6	17,784,000	150,000	8,817,000	50	26
Middle Kittanning	8.6	17,028,000	400,000	9,145,000	55	28
Upper Kittanning	1.5	2,835,000	500,000	1,051,000	45	21
Lower Freeport	------	------	------	------	------	------
Upper Freeport	------	------	------	------	------	------
Total		81,117,000	1,350,000	43,187,000		
Clay Township				Area 25.74 square miles		
Brookville	16.6	41,832,000	------	23,008,000	55	28
Clarion	3.0	5,940,000	------	2,673,000	45	22
Lower Kittanning	8.8	23,760,000	1,000,000	11,380,000	50	30
Middle Kittanning	9.1	16,380,000	------	7,371,000	45	20
Upper Kittanning	7.9	17,064,000	100,000	8,482,000	50	24
Lower Freeport	3.8	6,156,000	------	2,770,000	45	18
Upper Freeport	2.8	10,584,000	500,000	6,555,000	65	42
Total		121,716,000	1,600,000	62,239,000		
Clearfield Township				Area 22.26 square miles		
Brookville	15.1	43,488,000	------	23,918,000	55	32
Clarion	------	------	------	------	------	------
Lower Kittanning	6.8	15,912,000	100,000	7,906,000	50	26
Middle Kittanning	5.9	15,399,000	100,000	8,414,000	55	29
Upper Kittanning	8.4	19,656,000	100,000	10,756,000	55	26
Lower Freeport	6.9	17,388,000	900,000	8,244,000	50	28
Upper Freeport	7.3	21,024,000	2,000,000	10,463,000	55	32
Total		132,867,000	3,200,000	69,701,000		
Clinton Township				Area 24.3 square miles		
Brookville	16.0	43,200,000	------	28,080,000	65	30
Clarion	------	------	------	------	------	------
Lower Kittanning	8.4	15,876,000	------	7,144,000	45	21
Middle Kittanning	7.8	14,040,000	------	6,318,000	45	20
Upper Kittanning	11.2	26,208,000	------	14,414,000	55	26
Lower Freeport	9.2	14,904,000	------	6,707,000	45	18
Upper Freeport	8.4	33.264,000	500,000	21,296,000	65	44
Total		147,492,000	500,000	83,949,000		

Coal resources in Butler County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Concord Township				Area 24.5 square miles		
Brookville	14.6	49,932,000	-----	32,456,000	65	38
Clarion	-----	-----	-----	-----	-----	-----
Lower Kittanning	5.3	9,540,000	200,000	4,203,000	45	20
Middle Kittanning	6.8	12,240,000	-----	5,508,000	45	20
Upper Kittanning	8.6	23,220,000	150,000	13,872,000	60	30
Lower Freeport	3.1	5,022,000	-----	2,260,000	45	18
Upper Freeport	2.8	8,064,000	700,000	4,050,000	55	32
Total		108,018,000	1,050,000	62,349,000		
Connoquenessing Township				Area 24.34 square miles		
Brookville	17.1	46,170,000	-----	30,011,000	65	30
Clarion	-----	-----	-----	-----	-----	-----
Lower Kittanning	6.8	15,912,000	100,000	7,406,000	50	26
Middle Kittanning	6.7	13,276,000	-----	6,638,000	50	22
Upper Kittanning	11.9	27,846,000	100,000	15,260,000	55	26
Lower Freeport	7.9	14,220,000	-----	6,399,000	45	20
Upper Freeport	7.9	21,330,000	400,000	11,512,000	55	30
Total		138,754,000	600,000	77,226,000		
Cranberry Township				Area 24.4 square miles		
Brookville	17.4	53,244,000	-----	31,946,000	60	34
Clarion	-----	-----	-----	-----	-----	-----
Lower Kittanning	8.4	15,120,000	-----	6,804,000	45	20
Middle Kittanning	9.2	21,528,000	-----	10,764,000	50	26
Upper Kittanning	11.4	24,624,000	-----	12,312,000	50	24
Lower Freeport	7.8	13,338,000	-----	6,002,000	45	19
Upper Freeport	7.2	20,736,000	-----	11,405,000	55	32
Total		148,590,000	-----	79,233,000		
Donegal Township				Area 23.6 square miles		
Brookville	16.6	44,820,000	-----	26,892,000	60	30
Clarion	-----	-----	-----	-----	-----	-----
Lower Kittanning	4.5	7,695,000	100,000	3,418,000	45	19
Middle Kittanning	7.3	14,454,000	-----	5,508,000	45	22
Upper Kittanning	14.2	35,784,000	100,000	19,626,000	55	28
Lower Freeport	8.1	16,038,000	-----	7,217,000	45	22
Upper Freeport	7.2	25,920,000	1,500,000	15,873,000	65	40
Total		144,701,000	1,700,000	78,524,000		
Fairview Township				Area 24.74 square miles		
Brookville	15.6	47,736,000	-----	28,642,000	60	34
Clarion	9.5	25,650,000	-----	12,825,000	50	30
Lower Kittanning	6.2	11,718,000	150,000	5,206,000	50	27
Middle Kittanning	6.9	16,146,000	-----	8,073,000	50	26
Upper Kittanning	7.8	23,868,000	300,000	14,141,000	60	34
Lower Freeport	5.2	9,360,000	-----	4,212,000	45	20
Upper Freeport	3.9	10,881,000	1,000,000	5,434,000	55	31
Total		145,359,000	1,450,000	78,533,000		

Coal resources in Butler County by townships—Continued

Franklin Township — Area 25.84 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	17,2	49,536,000		29,722,000	60	32
Clarion						
Lower Kittanning	6.3	15,309,000	100,000	7,605,000	50	27
Middle Kittanning	8.4	16,632,000		8,316,000	50	22
Upper Kittanning	10.2	23,868,000	100,000	13,072,000	55	26
Lower Freeport	6.4	10,368,000		4,666,000	45	18
Upper Freeport	4.9	15,876,000	400,000	9,285,000	60	36
Total		131,589,000	600,000	72,666,000		

Forward Township — Area 24.08 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	15.0	37,800,000		24,570,000	65	28
Clarion						
Lower Kittanning	8.6	21,672,000	400,000	10,636,000	50	28
Middle Kittanning	7.8	16,848,000		8,424,000	50	24
Upper Kittanning	11.4	28,728,000		15,800,000	55	28
Lower Freeport	7.7	16,632,000		8,316,000	50	24
Upper Freeport	8.3	22,410,000	300,000	12,161,000	55	30
Total		144,090,000	700,000	79,907,000		

Jackson Township — Area 24.06 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	14.0	35,280,000		21,168,000	60	28
Clarion						
Lower Kittanning	6.8	13,464,000		6,059,000	45	22
Middle Kittanning	5.9	13,806,000	100,000	6,853,000	50	26
Upper Kittanning	10.2	29,376,000	100,000	17,566,000	60	32
Lower Freeport	5.1	11,934,000	500,000	5,717,000	50	26
Upper Freeport	6.4	23,040,000	200,000	14,846,000	65	40
Total		126,900,000	900,000	72,209,000		

Jefferson Township — Area 24.16 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	17.0	45,900,000		29,835,000	65	30
Clarion						
Lower Kittanning	8.5	18,360,000		9,180,000	50	24
Middle Kittanning	9.6	15,552,000		6,998,000	45	18
Upper Kittanning	10.6	25,712,000		14,142,000	55	28
Lower Freeport	6.8	12,240,000		5,508,000	45	20
Upper Freeport	7.2	22,572,000	400,000	13,303,000	60	34
Total		140,336,000	400,000	78,966,000		

Lancaster Township — Area 24.22 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	16.2	37,908,000		22,745,000	60	26
Clarion						
Lower Kittanning	6.2	12,276,000		5,524,000	45	22
Middle Kittanning	8.6	20,124,000		10,062,000	50	24
Upper Kittanning	8.4	21,168,000	200,000	11,532,000	55	28
Lower Freeport	5.8	10,962,000		4,933,000	45	21
Upper Freeport	4.9	15,876,000	300,000	9,346,000	60	36
Total		118,314,000	500,000	64,142,000		

Coal resources in Butler County by townships—Continued

Marion Township — Area 25.16 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	17.6	63,360,000	----------	35,848,000	55	40
Clarion	7.0	17,640,000	----------	7,938,000	45	28
Lower Kittanning	6.4	15,360,000	100,000	7,630,000	50	24
Middle Kittanning	7.4	17,316,000	----------	8,658,000	50	26
Upper Kittanning	----------	----------	----------	----------	----------	----------
Lower Freeport	----------	----------	----------	----------	----------	----------
Upper Freeport	----------	----------	----------	----------	----------	----------
Total		113,676,000	100,000	60,074,000		

Mercer Township — Area 13.24 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	6.2	23,436,000	----------	15,233,000	55	[illegible]
Clarion	5.0	12,600,000	----------	6,300,000	50	28
Lower Kittanning	3.4	7,956,000	100,000	3,928,000	50	26
Middle Kittanning	3.0	7,290,000	100,000	3,955,000	55	27
Upper Kittanning	----------	----------	----------	----------	----------	----------
Lower Freeport	----------	----------	----------	----------	----------	----------
Upper Freeport	----------	----------	----------	----------	----------	----------
Total		51,282,000	200,000	29,416,000		

Muddy Creek Township — Area 24.38 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	17.1	58,482,000	----------	37,513,000	65	[illegible]
Clarion	----------	----------	----------	----------	----------	----------
Lower Kittanning	6.8	19,584,000	100,000	10,551,000	55	32
Middle Kittanning	6.8	14,688,000	----------	7,344,000	50	24
Upper Kittanning	5.6	15,624,000	300,000	9,194,000	60	31
Lower Freeport	4.2	7,560,000	----------	3,402,000	45	20
Upper Freeport	3.1	8,370,000	200,000	4,324,000	55	30
Total		121,308,000	900,000	72,328,000		

Middlesex Township — Area 24.2 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	16.2	43,740,000	----------	28,431,000	65	3[illegible]
Clarion	----------	----------	----------	----------	----------	----------
Lower Kittanning	8.3	15,687,000	----------	7,059,000	45	21
Middle Kittanning	9.1	18,018,000	----------	9,009,000	50	22
Upper Kittanning	9.4	23,688,000	----------	13,028,000	55	28
Lower Freeport	7.8	12,636,000	----------	5,686,000	45	18
Upper Freeport	8.4	28,728,000	----------	17,237,000	60	38
Total		142,497,000	----------	80,450,000		

Oakland Township — Area 22.74 square miles

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Brookville	15.8	45,504,000	----------	27,302,000	[illegible]	22
Clarion	----------	----------	----------	----------	----------	----------
Lower Kittanning	5.4	13,668,000	100,000	6,754,000	50	28
Middle Kittanning	7.6	13,680,000	----------	6,156,000	45	20
Upper Kittanning	9.8	23,814,000	100,000	13,043,000	55	27
Lower Freeport	6.2	10,044,000	----------	4,520,000	45	18
Upper Freeport	5.8	16,704,000	300,000	9,022,000	55	32
Total		123,354,000	500,000	66,797,000		

Coal resources in Butler County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Parker Township						Area 24.28 square miles
Brookville	14.2	51,120,000	----	28,116,000	55	40
Clarion	11.2	34,272,000	500,000	16,886,000	55	34
Lower Kittanning	4.3	6,966,000	500,000	2,586,000	40	18
Middle Kittanning	7.6	20,520,000	100,000	11,231,000	55	30
Upper Kittanning	2.5	4,950,000	100,000	2,183,000	45	22
Lower Freeport	2.5	10,800,000	----	5,940,000	55	48
Upper Freeport	----	----	----	----	----	----
Total		128,628,000	1,200,000	66,942,000		
Penn Township						Area 18.5 square miles
Brookville	18.5	53,280,000	----	31,968,000	60	32
Clarion	----	----	----	----	----	----
Lower Kittanning	7.4	13,986,000	100,000	6,249,000	45	21
Middle Kittanning	7.2	13,608,000	----	6,804,000	50	21
Upper Kittanning	8.9	20,826,000	----	11,454,000	55	26
Lower Freeport	7.6	15,048,000	----	6,772,000	45	22
Upper Freeport	6.9	18,630,000	100,000	8,192,000	55	30
Total		135,378,000	200,000	71,439,000		
Slippery Rock Township						Area 25.84 square miles
Brookville	12.2	27,450,000	----	15,098,000	55	25
Clarion	6.0	14,040,000	----	7,020,000	50	26
Lower Kittanning	8.2	20,664,000	200,000	10,232,000	50	28
Middle Kittanning	7.2	15,552,000	----	7,776,000	50	24
Upper Kittanning	8.4	22,680,000	1,000,000	13,008,000	60	30
Lower Freeport	----	----	----	----	----	----
Upper Freeport	----	----	----	----	----	----
Total		100,386,000	1,200,000	53,134,000		
Summit Township						Area 24.40 square miles
Brookville	14.9	37,548,000	----	22,529,000	60	28
Clarion	----	----	----	----	----	----
Lower Kittanning	7.2	18,792,000	800,000	8,996,000	50	29
Middle Kittanning	6.7	11,763,000	----	5,882,000	50	21
Upper Kittanning	9.6	24,162,000	200,000	13,179,000	55	28
Lower Freeport	7.1	12,780,000	----	5,751,000	45	20
Upper Freeport	6.9	21,114,000	700,000	12,248,000	60	34
Total		126,159,000	1,700,000	68,585,000		
Venango Township						Area 24.08 square miles
Brookville	15.7	62,172,000	1,500,000	36,403,000	60	44
Clarion	8.0	22,320,000	----	11,160,000	50	31
Lower Kittanning	3.2	5,760,000	100,000	2,547,000	45	20
Middle Kittanning	7.4	13,320,000	----	5,994,000	45	20
Upper Kittanning	3.2	5,760,000	100,000	2,547,000	45	20
Lower Freeport	4.3	13,158,000	----	6,579,000	50	34
Upper Freeport	----	----	----	----	----	----
Total		122,490,000	1,700,000	65,230,000		

Coal resources in Butler County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Average thickness (inches)
Washington Township						Area 23.76 square miles
Brookville	16.8	59,256,000	2,500,000	34,054,000	60	38
Clarion	12.6	36,288,000		18,144,000	50	32
Lower Kittanning	4.1	7,380,000	100,000	3,276,000	45	20
Middle Kittanning	8.6	18,576,000		9,288,000	50	24
Upper Kittanning	7.2	12,960,000	400,000	5,652,000	45	20
Lower Freeport	1.2	2,160,000		972,000	45	20
Upper Freeport						
Total		136,620,000	3,000,000	71,386,000		
Winfield Township						Area 25.34 square miles
Brookville	16.3	46,944,000		28,166,000	60	32
Clarion						
Lower Kittanning	7.2	14,256,000		6,415,000	45	22
Middle Kittanning	7.2	13,608,000		6,804,000	50	21
Upper Kittanning	10.6	25,758,000		14,167,000	55	27
Lower Freeport	9.2	23,184,000	400,000	11,392,000	50	28
Upper Freeport	6.4	18,432,000	300,000	9,973,000	50	32
Total		142,182,000	700,000	76,917,000		
Worth Township						Area 24.56 square miles
Brookville	14.6	47,304,000		26,017,000	55	36
Clarion						
Lower Kittanning	4.5	12,150,000	600,000	5,775,000	50	30
Middle Kittanning	8.6	23,220,000	300,000	12,606,000	55	30
Upper Kittanning	1.0	2,160,000	300,000	837,000	45	24
Lower Freeport	3.6	8,424,000		3,791,000	45	26
Upper Freeport	2.1	5,292,000	100,000	2,596,000	50	28
Total		98,550,000	1,300,000	51,612,000		

CAMBRIA COUNTY

By
John F. Reese

INTRODUCTION

Cambria County is one of the few counties in the bituminous coal region of Pennsylvania which has four important coal beds. These beds have good thickness in different parts of the county and are exceptionally free from impurities and remarkably uniform in composition. Although Cambria County has been a large producer for many years, there are large areas of good coal just being prospected by core drill.

Mining towns are present throughout the entire county. The railroads are one of the greatest assets to the coal trade. Mining has flourished because of the easy accessibility of the coal.

COAL BEDS

Cambria County has six coal beds that are now of economic interest. In order of present importance as shipping coals they are; the Lower Kittanning, Upper Kittanning, Lower Freeport, Upper Freeport, Clarion, and Brookville.

Lower Kittanning coal. The numerous mines in this bed and exposures of its outcrop have furnished many measurements of its thickness, thus making possible an accurate and reliable computation of the quantity of coal it contains. The "B-Rider" coal of the Bens Creek area has been computed with the Lower Kittanning coal in this report.

The Lower Kittanning is the most persistent bed, contains the greatest coal resources, and is the largest producer within the county, yielding more than 8,100,000 tons annually.

Upper Kittanning coal. A fair quantity of information as to the thickness and persistency of this bed is available.

The bed is best suited for mining in the Patton, Portage, South Fork, and Johnstown areas.

The Upper Kittanning bed is fourth in size of resources within the county, and ranks second in production, with a total of over 3,600,000 tons annually.

Lower Freeport coal. A fairly accurate estimate of the quantity of coal in this bed is made possible by many measurements in the mines and on the outcrop.

It attains its best development for mining in the Barnesboro-Spangler area.

The Lower Freeport bed contains the second greatest resource within the county, and ranks third in production with a total of over 3,300,000 tons annually.

Upper Freeport coal. The extensive outcrop of this bed throughout the county and its development in various localities furnish a fair number of measurements for an accurate estimate of quantity.

It is mined most extensively in the Barnesboro, Hastings, Gallitzin, and Cresson areas where it attains its best thickness for mining.

The Upper Freeport coal is third in size of reserve in the county, and ranks fourth in production with a total of over 2,700,000 tons annually.

Clarion or A′ coal. This coal has been computed as of economic interest in Reade and Richland townships where it has been mined. Little is known of its thickness and extent, and only areas surrounding mining development or proven ground have been computed.

The Clarion coal is sixth in size of reserve within the county and ranks fifth in production with a total of over 90,000 tons annually.

Brookville or A coal. This bed has been considered of interest in five townships, namely Adams, Cresson, Dean, Gallitzin, and Richland. Only areas surrounding operations or proven ground have been computed, as little is known of the extent and persistency of this coal.

The Brookville coal is fifth in size of reserve within the county, and ranks sixth in production with a total of over 18,000 tons annually.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the order following: Lower Kittanning, Upper Freeport, Lower Freeport, Upper Kittanning, Brookville, and Clarion. Thus, while the figures for the Lower Kittanning bed are conservative and probably reliable, the figures for the Clarion coal may be much too small or many times too large.

Coal resources in Cambria County

Bed	Original Deposit	Mined out and lost	Recoverable
U. Freeport	1,016,000,000	74,050,000	711,920,000
L. Freeport	1,337,800,000	85,200,000	900,730,000
U. Kittanning	922,500,000	89,700,000	612,430,000
L. Kittanning	2,010,300,000	216,800,000	1,348,100,000
Clarion	32,406,000	1,000,000	21,300,000
Brookville	64,000,000	150,000	43,600,000
Total	5,383,000,000	466,900,000	3,638,080,000

Summary of recoverable coal in Cambria County

Township	U. Freeport	L. Freeport	U.Kittann'g	L. Kittann'g	Clarion	Brookville
Adams	29,000,000	26,500,000	83,200,000	76,800,000		4,300,000
Allegheny	57,600,000	65,600,000	5,500,000	64,500,000		
Barr	5,600,000	73,600,000	16,400,000	67,500,000		
Blacklick	14,000,000	72,100,000	37,400,000	73,200,000		
Cambria	50,000,000	116,600,000		138,000,000		
Chest	6,500,000	45,500,000	63,000,000	47,400,000		
Clearfield	21,600,000	57,500,000	29,000,000	54,300,000		
Conemaugh	12,800,000	11,300,000	7,500,000	10,500,000		
Cresson	24,200,000	14,500,000	17,600,000	32,000,000		10,800,000
Croyle	47,600,000	31,300,000	35,500,000	45,100,000		
Dean	14,000,000	11,200,000	21,800,000	46,800,000		11,000,000
E. Carroll	9,200,000	64,600,000	16,600,000	56,400,000		
East Taylor	18,300,000	12,600,000	8,500,000	20,400,000		
Elder	7,000,000	14,100,000	16,100,000	22,500,000		
Gallitzin	30,300,000	9,200,000	10,000,000	36,200,000		11,000,000
Jackson	32,800,000	48,300,000	25,700,000	81,200,000		
Johnstown City	120,000	130,000	230,000	2,700,000		
Lower Yoder	8,800,000	5,600,000	6,600,000	15,100,000		
Middle Taylor	16,500,000	7,600,000	8,800,000	15,700,000		
Munster	44,400,000	21,700,000		40,100,000		
Portage	24,000,000	13,000,000	12,200,000	19,500,000		
Reade	26,200,000	15,000,000	21,200,000	77,200,000	10,500,000	
Richland	19,000,000	21,000,000	53,100,000	48,200,000	10,800,000	6,500,000
Stony Creek	5,200,000	4,000,000	6,000,000	14,000,000		
Summerhill	60,700,000	31,500,000	33,000,000	62,300,000		
Susquehanna	56,200,000	41,500,000	17,000,000	54,200,000		
Upper Yoder	23,000,000	14,500,000	11,700,000	36,000,000		
Washington	18,800,000	10,800,000	9,100,000	19,000,000		
West Carroll		8,800,000	3,000,000	16,100,000		
West Taylor	1,300,000	1,100,000	1,200,000	4,400,000		
White	27,200,000	30,000,000	35,500,000	50,800,000		
Total	711,920,000	900,730,000	612,430,000	1,348,100,000	21,300,000	43,600,000

Coal resources in Cambria County by townships

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Adams Township							Area 53.6 square miles
U. Freeport	14.8	43,100,000	500,000	29,000,000	80	15	32–40
L. Freeport	15.4	40,500,000	1,500,000	26,500,000	80	15	24–34
U. Kittanning	31.7	110,100,000	1,300,000	83,200,000	90	15	32–42
L. Kittanning	35.7	137,500,000	37,000,000	76,800,000	90	15	30–52
Brookville	2.0	6,400,000	50,000	4,300,000	80	15	36
Total		337,600,000	40,350,000	219,800,000			

Coal resources in Cambria County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Allegheny Township							Area 31.7 square miles
U. Freeport	20.7	75,300,000		57,600,000	90	15	0–44
L. Freeport	31.6	96,500,000		65,600,000	80	15	0–36
U. Kittanning	2.9	7,500,000		5,500,000	80	15	24–30
L. Kittanning	31.3	84,400,000		64,500,000	90	15	24–36
Total		263,700,000		193,200,000			
Barr Township							Area 31.9 square miles
U. Freeport	2.0	7,300,000		5,600,000	90	15	0–42
L. Freeport	28.2	112,200,000	16,000,000	73,600,000	90	15	0–48
U. Kittanning	10.3	24,100,000		16,400,000	80	15	0–28
L. Kittanning	24.4	91,600,000	1,300,000	67,500,000	90	15	24–42
Total		235,200,000	17,300,000	163,100,000			
Blacklick Township							Area 33.3 square miles
U. Freeport	7.8	20,000,000		14,000,000	80	15	0–33
L. Freeport	26.5	94,500,000	300,000	72,100,000	90	15	28–42
U. Kittanning	22.3	55,000,000		37,400,000	80	15	24–36
L. Kittanning	30.9	122,200,000	26,500,000	73,200,000	90	15	42–50
Total		291,700,000	26,800,000	196,700,000			
Cambria Township							Area 51.9 square miles
U. Freeport	18.9	64,800,000		50,000,000	90	15	0–42
L. Freeport	48.7	152,500,000		116,600,000	90	15	0–46
L. Kittanning	51.9	187,400,000	7,000,000	138,000,000	90	15	30–46
Total		404,700,000	7,000,000	304,600,000			
Chest Township							Area 30.0 square miles
U. Freeport	3.3	9,500,000		6,500,000	80	15	0–32
L. Freeport	21.5	66,900,000		45,500,000	80	15	0–40
U. Kittanning	24.4	85,600,000	3,200,000	63,000,000	90	15	30–62
L. Kittanning	23.3	70,000,000	300,000	47,400,000	80	15	24–40
Total		232,000,000	3,500,000	162,400,000			
Clearfield Township							Area 30.4 square miles
U. Freeport	10.2	29,300,000	1,100,000	21,600,000	90	15	0–42
L. Freeport	27.4	84,500,000		57,500,000	80	15	34–42
U. Kittanning	11.7	38,200,000	400,000	29,000,000	90	15	26–46
L. Kittanning	29.6	79,900,000		54,300,000	80	15	30–42
Total		231,900,000	1,500,000	162,400,000			

Coal resources in Cambria County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Conemaugh Township							Area 11.2 square miles
U. Freeport	5.1	17,860,000	1,000,000	12,800,000	90	15	36–44
L. Freeport	6.2	16,600,000		11,300,000	80	15	28–30
U. Kittanning	6.5	20,300,000	10,500,000	7,500,000	90	15	28–42
L. Kittanning	8.4	35,200,000	21,400,000	10,500,000	90	15	42–72
Total		89,900,000	32,900,000	42,100,000			
Cresson Township							Area 13.0 square miles
U. Freeport	9.9	42,400,000	10,800,000	24,200,000	90	15	44–52
L. Freeport	8.9	21,400,000		14,500,000	80	15	24–34
U. Kittanning	9.0	26,100,000	200,000	17,600,000	80	15	24–36
L. Kittanning	12.3	43,400,000	1,500,000	32,000,000	90	15	24–42
Brookville	5.0	16,000,000		10,800,000	80	15	36
Total		149,300,000	12,500,000	99,100,000			
Croyle Township							Area 21.3 square miles
U. Freeport	18.5	63,600,000	1,300,000	47,600,000	90	15	32–48
L. Freeport	17.6	48,300,000	2,200,000	31,300,000	80	15	30–48
U. Kittanning	13.7	47,300,000	900,000	35,500,000	80	15	24–42
L. Kittanning	19.6	76,200,000	17,200,000	45,100,000	90	15	42–50
Total		235,400,000	21,600,000	159,500,000			
Dean Township							Area 21.7 square miles
U. Freeport	5.3	19,300,000	1,100,000	14,000,000	90	15	36–48
L. Freeport	4.9	16,400,000		11,200,000	80	15	30–48
U. Kittanning	7.5	32,800,000	4,300,000	21,800,000	90	15	30–48
L. Kittanning	16.7	61,500,000	300,000	46,800,000	90	15	36–42
Brookville	5.0	16,000,000		11,000,000	80	15	36
Total		146,000,000	5,700,000	104,800,000			
East Carroll Township							Area 26.8 square miles
U. Freeport	5.0	13,500,000		9,200,000	80	15	0–36
L. Freeport	22.7	86,800,000	2,300,000	64,600,000	90	15	34–55
U. Kittanning	7.8	28,000,000	6,300,000	16,600,000	90	15	24–58
L. Kittanning	26.8	74,500,000	800,000	56,400,000	90	15	30–42
Total		202,800,000	9,400,000	146,800,000			
East Taylor Township							Area 11.4 square miles
U. Freeport	6.7	26,800,000	2,900,000	18,300,000	90	15	36–48
L. Freeport	7.0	18,500,000		12,600,000	80	15	0–30
U. Kittanning	4.2	12,200,000	1,100,000	8,500,000	90	15	30–36
L. Kittanning	8.9	36,900,000	2,000,000	20,400,000	90	15	44–56
Total		94,400,000	6,000,000	59,800,000			

Coal resources in Cambria County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Elder Township							Area 14.5 square miles
U. Freeport	3.0	9,700,000	600,000	7,000,000	90	15	0-36
L. Freeport	6.4	24,700,000	6,300,000	14,100,000	90	15	36-70
U. Kittanning	9.0	33,900,000	12,800,000	16,100,000	90	15	26-58
L. Kittanning	11.2	35,300,000	2,200,000	22,500,000	80	15	24-48
Total	----------	103,600,000	21,900,000	59,700,000	----------	----------	----------
Gallitzin Township							Area 19.1 square miles
U. Freeport	15.6	65,100,000	25,500,000	30,300,000	90	15	36-48
L. Freeport	5.0	13,500,000	----------	9,200,000	80	15	30-36
U. Kittanning	5.5	14,700,000	----------	10,000,000	80	15	24-34
L. Kittanning	17.6	47,500,000	200,000	36,200,000	90	15	24-36
Brookville	5.0	16,000,000	----------	11,000,000	80	15	36
Total	----------	156,800,000	25,700,000	96,700,000	----------	----------	----------
Jackson Township							Area 48.3 square miles
U. Freeport	12.9	43,200,000	300,000	32,800,000	90	15	0-42
L. Freeport	23.5	63,500,000	300,000	48,300,000	90	15	28-36
U. Kittanning	15.5	37,800,000	----------	25,700,000	80	15	24-26
L. Kittanning	30.7	123,900,000	17,800,000	81,200,000	90	15	36-50
Total	----------	268,400,000	18,400,000	188,000,000	----------	----------	----------
Johnstown City							Area 1.1 square miles
U. Freeport	.1	300,000	150,000	120,000	90	15	36-44
L. Freeport	.1	200,000	----------	130,000	80	15	28-30
U. Kittanning	.2	600,000	300,000	230,000	90	15	34-42
L. Kittanning	1.1	4,200,000	600,000	2,700,000	90	15	40-46
Total	----------	5,300,000	1,050,000	3,180,000	----------	----------	----------
Lower Yoder Township							Area 13.2 square miles
U. Freeport	3.3	11,600,000	----------	8,800,000	90	15	32-42
L. Freeport	3.2	8,600,000	300,000	5,600,000	80	15	28-30
U. Kittanning	3.6	10,100,000	1,500,000	6,600,000	90	15	30-36
L. Kittanning	6.3	22,700,000	2,900,000	15,100,000	90	15	[illegible]
Total	----------	53,000,000	4,700,000	36,100,000	----------	----------	----------
Middle Taylor Township							Area 6.8 square miles
U. Freeport	5.6	22,000,000	400,000	16,500,000	90	15	36-48
L. Freeport	4.5	11,300,000	100,000	7,600,000	80	15	28-30
U. Kittanning	4.8	12,900,000	----------	8,800,000	80	15	30-36
L. Kittanning	5.0	20,600,000	----------	115,700,000	90	15	36-46
Total	----------	66,800,000	500,000	48,600,000	----------	----------	----------

Coal resources in Cambria County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Munster Township							Area 15.1 square miles
U. Freeport	15.1	58,000,000	----------	44,400,000	90	15	36–48
L. Freeport	15.1	32,000,000	----------	21,700,000	80	15	24–34
L. Kittanning	15.1	52,500,000	----------	40,100,000	90	15	24.42
Total	----------	142,500,000	----------	106,200,000	----------	----------	----------
Portage Township							Area 19.4 square miles
U. Freeport	10.2	41,900,000	10,500,000	24,000,000	90	15	42–48
L. Freeport	7.0	19,300,000	300,000	13,000,000	80	15	24–36
U. Kittanning	7.2	24,300,000	8,300,000	12,200,000	90	15	24–48
L. Kittanning	12.1	45,700,000	20,200,000	19,500,000	90	15	36–48
Total	----------	131,200,000	39,300,000	68,700,000	----------	----------	----------
Reade Township							Area 36.4 square miles
U. Freeport	12.2	35,600,000	1,300,000	26,200,000	90	15	30–36
L. Freeport	6.8	23,000,000	900,000	15,000,000	80	15	24–42
U. Kittanning	9.0	29,300,000	1,600,000	21,200,000	90	15	24–56
L. Kittanning	29.4	103,500,000	2,600,000	77,200,000	90	15	36–42
Clarion	5.0	16,200,000	700,000	10,500,000	80	15	36
Total	----------	207,600,000	7,100,000	150,100,000	----------	----------	----------
Richland Township							Area 25.4 square miles
U. Freeport	8.8	27,800,000	----------	19,000,000	80	15	32–40
L. Freeport	11.5	31,000,000	200,000	21,000,000	80	15	24–30
U. Kittanning	20.2	77,700,000	8,300,000	53,100,000	90	15	24–48
L. Kittanning	23.1	91,800,000	28,800,000	48,200,000	90	15	32–54
Clarion	5.0	16,200,000	300,000	10,800,000	80	15	36
Brookville	3.0	9,600,000	100,000	6,500,000	80	15	36
Total	----------	254,100,000	37,700,000	158,600,000	----------	----------	----------
Stony Creek Township							Area 5.0 square miles
U. Freeport	2.4	8,100,000	1,300,000	5,200,000	90	15	36–44
L. Freeport	2.4	6,000,000	200,000	4,000,000	80	15	24–36
U. Kittanning	3.7	14,600,000	6,800,000	6,000,000	90	15	36–64
L. Kittanning	4.9	19,200,000	1,000,000	14,000,000	90	15	36–44
Total	----------	47,900,000	9,300,000	29,200,000	----------	----------	----------
Summerhill Township							Area 25.6 square miles
U. Freeport	21.5	82,400,000	3,000,000	60,700,000	90	15	36–48
L. Freeport	18.2	47,000,000	700,000	31,500,000	80	15	24–48
U. Kittanning	14.2	48,900,000	300,000	33,000,000	80	15	24–42
L. Kittanning	23.1	87,700,000	6,300,000	62,300,000	90	15	32–44
Total	----------	266,000,000	10,300,000	187,500,000	----------	----------	----------

Coal resources in Cambria County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Susquehanna Township				Area 31.4 square miles			
U. Freeport	21.9	83,500,000	10,000,000	56,200,000	90	15	24–64
L. Freeport	22.2	94,500,000	40,300,000	41,500,000	90	15	36–62
U. Kittanning	6.0	22,900,000	500,000	17,000,000	80	15	26–58
L. Kittanning	21.9	72,100,000	1,200,000	54,200,000	90	15	24–40
Total		273,000,000	52,000,000	168,900,000			
Upper Yoder Township				Area 15.8 square miles			
U. Freeport	9.2	30,700,000	700,000	23,000,000	90	15	32–42
L. Freeport	8.0	21,600,000	300,000	14,500,000	80	15	24–36
U. Kittanning	10.5	35,500,000	20,200,000	11,700,000	90	15	30–44
L. Kittanning	13.5	47,300,000	300,000	36,000,000	90	15	36–42
Total		135,100,000	21,500,000	85,200,000			
Washington Township				Area 15.0 square miles			
U. Freeport	6.2	25,700,000	1,100,000	18,800,000	90	15	36–48
L. Freeport	6.4	15,900,000		10,800,000	80	15	24–36
U. Kittanning	4.7	13,700,000	300,000	9,100,000	80	15	24–36
L. Kittanning	8.8	33,200,000	8,300,000	19,000,000	90	15	36–42
Total		88,500,000	9,700,000	57,700,000			
West Carroll Township				Area 10.6 square miles			
L. Freeport	6.0	24,500,000	13,000,000	8,800,000	90	15	46–52
U. Kittanning	1.5	4,300,000	400,000	3,000,000	90	15	0–44
L. Kittanning	10.0	30,200,000	9,100,000	16,100,000	90	15	30–42
Total		59,000,000	22,500,000	27,900,000			
West Taylor Township				Area 5.0 square miles			
U. Freeport	.5	1,700,000		1,300,000	90	15	0–40
L. Freeport	.7	1,600,000		1,100,000	80	15	24–30
U. Kittanning	.7	1,800,000	200,000	1,200,000	90	15	30–36
L. Kittanning	1.4	5,700,000		4,400,000	90	15	36–52
Total		10,800,000	200,000	8,000,000			
White Township				Area 23.3 square miles			
U. Freeport	13.4	36,000,000	500,000	27,200,000	90	15	0–36
L. Freeport	14.4	44,000,000		30,000,000	80	15	24–42
U. Kittanning	15.6	52,300,000		35,500,000	80	15	30–44
L. Kittanning	23.2	66,500,000		50,800,000	90	15	24–40
Total		198,800,000	500,000	143,500,000			

CAMERON COUNTY

By
James D. Sisler

INTRODUCTION

The coal beds of Cameron County occur at the base of the Allegheny group and in the Pottsville series. Practically all of the production is for local use. The area of coal-bearing rocks is small. The Cameron basin, extending midway between West Branch and Sterling, contains practically all of the coal in the county, except a few small areas in the northwestern part. Production from these coal beds has been so small, and their future value so uncertain, that computations were not made on a township basis.

COAL BEDS

Alton (Mercer?) coal. This bed averages 3 feet thick, but not all of it is mineable, as it is generally split into two benches by a shale parting near the middle.

Clermont coal. This bed, probably the Clarion bed of the main coal field, has been opened at several places in the Cameron basin, but production has been small. It averages 3 feet thick and is locally a good clean coal but high in sulphur.

Lower Kittanning coal. This bed is geologically the highest coal in Cameron County and is present only in isolated areas in the Cameron basin. Here it averages 3 feet thick, having a maximum thickness of 3 feet 8 inches. Very little mining has been done in this bed.

COAL RESOURCES

The information upon which the following computations were made was not all that could be desired. However, the computations are reasonably accurate. The Lower Kittanning and Clermont coals are sixty per cent recoverable, the Alton coal is fifty per cent mineable.

Coal resources of Cameron County

Bed	Mineable area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable
L. Kittanning	2	6,480,000	50,000	3,858,000
Clarion or Brookville	7	22,680,000	125,000	13,533,000
Alton or Mercer	12	32,400,000	60,000	16,170,000
Total		61,560,000	235,000	33,561,000

CENTRE COUNTY

By
James D. Sisler

INTRODUCTION

Centre County is situated on the eastern edge of the main bituminous coal field. The coal beds are contained in two basins having a northeast-southwest trend. The areas underlain by coal are isolated. The principal area of coal is in the vicinity of Philipsburg, Snow Shoe, and Beech Creek. The axis of the trough wherein these coal beds occur rises and falls, lifting the coal beds into the air and again making them occur in the hilltops. The West Branch of the Susquehanna marks the end of the second basin, which preserves a few acres of coal near Karthaus. This county has produced coal for many years. Much of it has been sold in New York State for domestic and steam fuel. In latter years it has not figured to any great extent in the total coal production of the State.

COAL BEDS

The coal beds of Centre County are contained in the Allegheny group of rocks. The Brookville, Lower, Middle and Upper Kittanning, Lower and Upper Freeport are all mineable in this county.

Brookville coal. This bed is geologically the lowest coal, is generally a dirty bed, but it is locally thick and has good quality. It is mined for commercial shipment in Rush Township. The Brookville coal is also mined on Cherry Run in Snow Shoe Township. Here it is 3 feet 6 inches to 4 feet 2 inches thick. The coal is rather high in sulphur and ash. The Brookville bed contains the largest recoverable tonnage, 114 million tons.

Lower Kittanning coal. This coal lying about 55 feet above the Brookville, is one of the important coals of Centre County. Forty-five million tons of coal have been mined out and lost from this bed. The Lower Kittanning is mineable at practically all of its localities. In Rush Township it is variable in thickness, averaging 3 feet 4 inches of mineable coal. It is also mined in Burnside Township where it has the same thickness. In Snow Shoe Township it is not so thick but is mined extensively. Its quality is excellent.

Middle Kittanning coal. This bed is thin and unimportant in Centre County. It has been figured as a resource because it is mineable locally and coal will be produced from it in the future. The calculation of resources of this bed is extremely conservative. The Middle Kittanning ranges from a few inches to 5 feet thick and where thickest is generally impure.

Upper Kittanning coal. This bed lying at an average interval of 75 feet above the Lower Kittanning, is also a very important coal in Centre County. Much coal has been mined from this bed, and 53 million tons of recoverable coal remain in it. The Upper Kittanning averages 3 feet thick. Locally it is 4 feet. The coal from this bed has exceptionally good quality when it is properly prepared.

Lower Freeport coal. This bed occurs only in the highest hilltops of Burnside, Rush, and Snow Shoe townships. Half of the coal in this bed has been exhausted. It ranges from 2 to 5 feet thick and averages approximately 3 feet 2 inches thick. Locally on Cherry Run in the Snow Shoe-Moshannon district the Lower Freeport is 6 feet thick, but this thickness is unusual.

Upper Freeport coal. This bed caps about twenty of the highest knobs on the western flank of Allegheny Mountain. It ranges from 2 feet 6 inches to 5 feet thick and has good quality. Much of this bed has been exhausted. Approximately one million tons of recoverable coal remain. The calculation of coal resources in this county is fairly accurate, particularly in Snow Shoe and Rush townships. The tonnages mined out were apportioned to the various townships according to the observation made by the author. Very few mine maps were available in this county. The calculations of resources in the Lower and Upper Kittanning are the most accurate.

Coal resources in Centre County.

Bed	Original deposit	Mined out and lost	Recoverable
Upper Freeport	8,640,000	7,000,000	1,180,000
Lower Freeport	14,310,000	4,600,000	4,368,000
Upper Kittanning	32,976,000	15,600,000	53,320,000
Middle Kittanning	43,605,000	----------	24,193,000
Lower Kittanning	169,164,000	45,450,000	77,296,000
Brookville	245,790,000	6,600,000	114,719,000
Total	514,485,000	79,250,000	275,076,000

Summary of recoverable coal in Centre County.

Township	Brookville	Lower Kittanning	Middle Kittanning	Upper Kittanning	Lower Freeport	Upper Freeport
Burnside	26,884,000	17,392,000	10,908,000	46,696,000	2,008,000	662,000
Curtin	1,521,000	2,163,000	567,000	----------	----------	----------
Rush	48,087,000	33,832,000	1,738,000	1,081,000	1,467,000	302,000
Snow Shoe	38,227,000	23,909,000	10,980,000	5,543,000	893,000	216,000
Total	114,719,000	77,296,000	24,193,000	53,320,000	4,368,000	1,180,000

11,290,600

Coal resources in Centre County by townships

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Average thickness (inches)
Burnside Township						Area 88.52 square miles
Brookville	18.2	62,244,000	2,500,000	26,884,000	45	38
L. Kittanning	12.1	43,560,000	15,500,000	17,392,000	62	40
Middle Kittanning	10.1	18,180,000	--------------	10,908,000	60	20
Upper Kittanning	4.1	13,284,000	6,100,000	46,696,000	65	36
L. Freeport	1.7	5,814,000	1,350,000	2,008,000	45	38
U. Freeport	1.0	3,420,000	2,500,000	662,000	72	38
Total	----------	146,502,000	27,950,000	104,550,000	----------	----------
Curtin Township						Area 40.48 square miles
Brookville	2.1	3,582,000	500,000	1,521,000	45	38
L. Kittanning	.9	3,240,000	750,000	2,163,000	62	40
M. Kittanning	.3	567,000	--------------	567,000	60	21
Total	----------	7,389,000	1,250,000	4,251,000	----------	----------
Rush Township, including Philipsburg						Area 157.32 square miles
Brookville	30.1	108,360,000	1,500,000	48,087,000	45	40
L. Kittanning	20.5	73,800,000	19,200,000	33,832,000	62	40
M. Kittanning	16.1	2,898,000	--------------	1,738,000	60	18
U. Kittanning	7.4	2,664,000	1,000,000	1,081,000	65	36
L. Freeport	1.6	5,760,000	2,500,000	1,467,000	45	40
U. Freeport	1.0	3,420,000	3,000,000	302,000	72	38
Total	----------	196,902,000	27,200,000	86,507,000	----------	----------
Snow Shoe Township						Area 78.60 square miles
Brookville	22.1	71,604,000	2,100,000	38,227,000	55	36
L. Kittanning	14.2	48,564,000	10,000,000	23,909,000	62	38
M. Kittanning	12.2	21,960,000	--------------	10,980,000	50	20
U. Kittanning	5.2	17,028,000	8,500,000	5,543,000	65	36
L. Freeport	.8	2,736,000	750,000	893,000	45	38
U. Freeport	.5	1,800,000	1,500,000	216,000	72	40
Total	----------	163,692,000	22,850,000	79,768,000	----------	----------

CLARION COUNTY

By
James D. Sisler

INTRODUCTION

Clarion County is in the northwestern part of Pennsylvania, and is bounded on the west by Allegheny River and on the south by Redbank Creek. This county lies on the northern edge of the main bituminous coal field and coal development has been slow because better coal is more accessible to large consuming centers. The principal mining district is along the Pennsylvania Railroad on the slopes of Allegheny River and Redbank Creek. Some mining has also been done in the vicinity of Clarion.

COAL BEDS

Clarion County has twelve coal beds, four of which are now being mined for shipping coal; five others are mined for local fuel, and remainder have little commercial importance at present.

Mercer coals. The Mercer coals are impure and only locally thick enough to be mined. The quantity of recoverable coal in these beds is very small. The Brookville is very irregular in thickness in Clarion County, but has some commercial value in several townships, particularly those in the eastern part of the county. When the thicker beds have been mined out, the Brookville will have much commercial importance.

Clarion Lower coal. Two coals occur at the horizon of the Clarion. The Clarion Lower coal contains the largest quantity of recoverable coal of any bed in Clarion County. This bed is most important in the southwestern part of the county where it is persistent and ranges from two to seven feet thick. It is mineable also in the vicinity of Clarion where it has a maximum thickness of 6 feet and averages 5 feet. It has been mined at this locality for many years. The recovery has been low because of several bone and pyrite partings which mix with the coal when it is shot down.

Clarion Upper coal. The Clarion Upper coal, which appears to be a split from the Clarion Lower coal, is extremely irregular in

thickness but has value on Allegheny River at Parkers Landing and St. Petersburg where small quantities have been mined for shipment.

Kittanning coals. The Lower Kittanning coal is the most persistent and important producing bed in Clarion County. It averages three feet thick and contains only local thin partings. More coal has been mined from this bed than all the other beds in the county. Its resources rank second in size to that of the Lower Clarion.

The Middle and Upper Kittanning coals are extremely variable in thickness and have been mined only for local fuel. They average less than two feet thick.

Lower Freeport coal. This bed has been entirely eroded north of Clarion River and is contained only in the highlands north of Redbank Creek. It is more regular in thickness than the Upper Freeport but it is thin and rather dirty. Very little mining has been done in this bed, and possibly all of it has been in the vicinity of New Bethlehem.

Upper Freeport coal. This bed is present only in some 50 hilltops along the southern border of the county. It ranges from 18 inches to 6 feet 3 inches thick, not including persistent bony benches above and below the main bench. It is persistent and mineable in practically all its area.

COAL RESOURCES

The following tables give the estimated quantity of coal in the original deposit, quantity of coal mined out and lost, and quantity recoverable in each township. The tables also give the workable area of each coal bed in each township. Another table summarizes the coal resources by beds in Clarion County.

The data on some of the beds in certain townships are very meager, and the writer was necessarily forced to generalize the figures somewhat. As more data are collected the estimates may be changed. However, the total quantity of coal recoverable in each township is very reliable.

Summary of coal resources in Clarion County

Bed	Workable Area (Sq. Mi.)	Original Deposit	Mined out and lost	Recoverable
Upper Freeport	11.5	49,900,000	1,000,000	29,200,000
Lower Freeport	19.7	46,700,000	500,000	27,700,000
Upper Kittanning	15.0	34,700,000	500,000	17,800,000
Middle Kittanning	29.0	59,300,000	500,000	31,200,000
Lower Kittanning	138.8	460,300,000	42,000,000	276,000,000
Upper Clarion	92.0	226,200,000	----------	144,000,000
Lower Clarion	245.7	771,100,000	12,800,000	498,200,000
Brookville	210.5	353,700,000	2,700,000	215,900,000
Mercer	22	40,900,000	----------	21,700,000
Total	784.2	2,042,800,000	60,000,000	1,262,300,000

Summary of recoverable coal in Clarion County

Township	Mercer	Brookville	L. Clarion	U. Clarion	L. Kittann'g
Ashland	7,800,000		17,700,000	10,000,000	3,400,000
Beaver	13,900,000		24,200,000	14,100,000	10,500,000
Brady		900,000	1,600,000		700,000
Clarion		28,700,000	50,000,000		18,000,000
Elk		10,500,000	23,700,000		1,700,000
Farmington		1,300,000	2,100,000		
Highland		4,200,000	6,800,000		
Knox		5,500,000	8,400,000		
Licking		6,800,000	11,700,000	7,500,000	3,400,000
Limestone		11,500,000	16,900,000		17,500,000
Madison		23,600,000	45,800,000	40,900,000	24,000,000
Mill Creek		6,300,000	11,400,000		900,000
Monroe		17,800,000	30,300,000		24,200,000
Paint		8,400,000	15,900,000		2,000,000
Perry		13,500,000	22,000,000	12,500,000	17,000,000
Piney		11,500,000	22,700,000		7,900,000
Porter		26,900,000	48,300,000		60,200,000
Redbank		22,700,000	33,000,000		44,300,000
Richland			19,400,000	9,000,000	1,800,000
Salem			23,600,000	14,000,000	2,800,000
Toby		12,300,000	56,400,000	36,000,000	36,300,000
Washington		3,500,000	6,300,000		
Total	21,700,000	215,900,000	498,200,000	144,000,000	276,600,000

Township	M. Kittann'g	U. Kittann'g	L. Freeport	U. Freeport	Total
Ashland					38,900,000
Beaver					62,700,000
Brady					3,200,000
Clarion	2,600,000	1,700,000			101,000,000
Elk					35,900,000
Farmington					3,400,000
Highland					11,000,000
Knox					13,900,000
Licking	900,000				30,300,000
Limestone		3,700,000	1,700,000	2,200,000	53,500,000
Madison			6,900,000	11,600,000	152,800,000
Mill Creek					18,600,000
Monroe		500,000			72,800,000
Paint					26,300,000
Perry			1,900,000	2,100,000	69,000,000
Piney					42,100,000
Porter	17,300,000	6,100,000	2,500,000	700,000	162,000,000
Redbank	10,400,000	5,800,000	6,500,000	4,300,000	127,000,000
Richland					30,200,000
Salem					40,400,000
Toby			8,200,000	8,300,000	157,500.000
Washington					9,800,000
Total	31,200,000	17,800,000	27,700,000	29,200,000	1,262,300,000

Coal resources in Clarion County by townships

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Average thickness (inches)
Ashland Township						Area 23 square miles
Mercer	9.0	15,700,000	—	7,800,000	50	18
L. Clarion	8.0	27,200,000	—	17,700,000	65	34
U. Clarion	7.0	16,200,000	—	10,000,000	60	24
L. Kittanning	2.0	6,200,000	—	3,400,000	55	20
Total	26.0	65,300,000	—	38,900,000	—	—
Beaver Township						Area 29 square miles
Mercer	13.0	25,200,000	—	13,900,000	55	20
L. Clarion	12.0	37,200,000	—	24,200,000	65	32
U. Clarion	11.0	23,500,000	—	14,100,000	60	22
L. Kittanning	6.0	17,500,000	—	10,500,000	60	30
Total	42.0	103,400,000	—	62,700,000	—	—
Brady Township						Area 3 square miles
Brookville	1.0	1,700,000	—	900,000	55	18
Clarion	.7	2,500,000	—	1,600,000	65	36
L. Kittanning	.4	1,200,000	—	700,000	60	32
Total	2.1	5,400,000	—	3,200,000	—	—
Clarion Township, including Clarion borough						Area 33 square miles
Brookville	23.0	44,700	500,000	28,700,000	65	20
Clarion	22.0	76,800	6,000,000	50,000,000	70	36
L. Kittanning	8.6	28,300	500,000	18,000,000	65	34
M. Kittanning	3.0	5,200	—	2,600,000	50	18
U. Kittanning	1.0	2,300	—	1,700,000	50	24
Total	57.6	157,300	7,000,000	101,000,000	—	—
Elk Township						Area 31 square miles
Brookville	10.0	17,500,000	—	10,500,000	60	18
Clarion	9.0	34,900,000	—	23,700,000	65	40
L. Kittanning	1.0	2,900,000	—	1,700,000	60	30
Total	20.0	55,300,000	—	35,900,000	—	—
Farmington Township						Area 62 square miles
Brookville	1.5	2,600,000	—	1,300,000	50	18
Clarion	1.0	3,500,000	—	2,100,000	60	36
Total	2.5	6,100,000	—	3,400,000	—	—

Coal resources in Clarion County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Average thickness (inches)
Highland Township					Area 17 square miles	
Brookville	4.0	7,000,000		4,200,000	60	18
Clarion	3.0	10,500,000		6,800,000	65	36
Total	7.0	17,500,000		11,000,000		
Knox Township					Area 18 square miles	
Brookville	6.0	10,500,000		5,500,000	50	18
Clarion	4.0	14,000,000		8,400,000	60	36
Total	10.0	24,500,000		13,900,000		
Licking Township					Area 18 square miles	
Brookville	6.0	10,500,000		6,800,000	65	18
L. Clarion	6.0	18,000,000		11,700,000	65	31
U. Clarion	5.0	11,600,000		7,500,000	65	24
L. Kittanning	2.3	5,300,000		3,400,000	65	24
M. Kitanning	1.0	1,700,000		900,000	50	18
Total	20.3	47,100,000		30,300,000		
Mill Creek Township					Area 30 square miles	
Brookville	6.0	10,500,000		6,300,000	60	18
Clarion	5.0	17,500,000		11,400,000	65	36
L. Kittanning	.5	1,500,000		900,000	60	30
Total	11.5	29,500,000		18,600,000		
Monroe Township					Area 29 square miles	
Brookville	17.0	29,700,000		17,800,000	60	18
Clarion	16.0	46,600,000		30,300,000	65	30
L. Kittanning	10.5	34,600,000		24,200,000	70	34
U. Kittanning	.5	900,000		500,000	50	18
Total	44.0	111,800,000		72,800,000		
Paint Township					Area 22 square miles	
Brookville	8.0	14,000,000		8,400,000	60	18
Clarion	7.0	24,400,000		15,900,000	65	36
L. Kittanning	16.0	2,900,000		2,000,000	70	30
Total	31.0	41,300,000		26,300,000		
Piney Township					Area 17 square miles	
Brookville	11.0	19,200,000		11,500,000	60	18
Clarion	10.0	34,900,000		22,700,000	65	36
L. Kittanning	4.5	13,100,000		7,900,000	60	30
Total	25.5	67,200,000		42,100,000		

Coal resources in Clarion County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Average thickness (inches)
Porter Township						Area 42 square miles
Brookville	33.0	44,800,000	----------	26,900,000	60	14
Clarion	32.0	74,500,000	200,000	48,300,000	65	24
L. Kittanning	27.0	89,000,000	3,000,000	60,200,000	70	34
M. Kittanning	15.0	34,900,000	250,000	17,300,000	50	24
U. Kittanning	5.0	12,600,000	400,000	6,100,000	50	26
L. Freeport	1.2	4,200,000	100,000	2,500,000	60	36
U. Freeport	.5	1,600,000	400,000	700,000	60	34
Total	113.7	261,000,000	4,350,000	162,000,000	----------	----------
Redbank Township						Area 32 square miles
Brookville	20.0	34,900,000	----------	22,700,000	65	18
Clarion	22.0	51,200,000	500,000	33,000,000	65	24
L. Kittanning	19.0	66,300,000	3,000,000	44,300,000	70	36
M. Kittanning	1.0	17,500,000	250,000	10,400,000	60	18
U. Kittanning	6.0	11,600,000	100,000	5,800,000	50	20
L. Freeport	4.0	10,900,000	100,000	6,500,000	60	28
U. Freeport	2.0	7,400,000	300,000	4,300,000	60	35
Total	83.0	199,800,000	4,250,000	127,000,000	----------	----------
Richland Township						Area 16 square miles
L. Clarion	8.0	28,000,000	350,000	19,400,000	70	36
U. Clarion	6.0	14,000,000	200,000	9,000,000	65	24
L. Kittanning	1.5	3,000,000	----------	1,800,000	60	20
Total	15.5	45,000,000	550,000	30,200,000	----------	----------
Salem Township						Area 16 square miles
L. Clarion	11.0	36,300,000	----------	23,600,000	65	34
U. Clarion	10.0	23,300,000	----------	14,000,000	60	24
L. Kittanning	6.0	11,600,000	----------	2,800,000	50	20
Total	27.0	71,200,000	----------	40,400,000	----------	----------
Limestone Township						Area 35 square miles
Brookville	11	19,200,000	1,500,000	11,500,000	65	18
Clarion	10	31,000,000	5,000,000	16,900,000	65	32
L. Kittanning	8	27,900,000	1,000,000	17,500,000	65	36
U. Kittanning	2.5	7,300,000	----------	3,700,000	50	30
L. Freeport	1.5	2,900,000	----------	1,700,000	60	20
U. Freeport	1.0	3,700,000	----------	2,200,000	60	38
Total	34.0	92,000,000	7,500,000	53,500,000	----------	----------
Madison Township						Area 26 square miles
Brookville	29	39,400,000	100,000	23,600.000	60	14
L. Clarion	28	70,600,000	200,000	45,800,000	65	26
U. Clarion	27	62,900,000	----------	40,900,000	65	24
L. Kittanning	16.5	54,400,000	20,000,000	24,000,000	70	34
L. Freeport	6	11,600,000	100,000	6,900,000	60	18
U. Freeport	4	19,700,000	300,000	11,600,000	60	38
Total	110.5	258,600,000	20,700,000	152,800,000	----------	----------

Coal resources in Clarion County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Average thickness (inches)
Perry Township						Area 31 square miles
Brookville	17	23,000,000	500,000	13,500,000	60	14
L. Clarion	11	34,100,000	250,000	22,000,000	65	32
U. Clarion	9	19,200,000	----------	12,500,000	65	22
L. Kittanning	8	24,800,000	500,000	17,000,000	70	32
L. Freeport	2	3,500,000	100,000	1,900,000	55	18
U. Freeport	1	3,500,000	----------	2,100,000	60	36
Total	48	108,100,000	1,350,000	69,000,000	----------	----------
Toby Township						Area 29 square miles
Brookville	20	17,500,000	100,000	12,300,000	65	14
L. Clarion	28	86,900,000	100,000	56,400,000	65	32
U. Clarion	26	55,500,000	----------	36,000,000	65	22
L. Kittanning	24	69,800,000	14,000,000	36,300,000	65	30
L. Freeport	7	13,600,000	----------	8,200,000	60	20
U. Freeport	4	14,000,000	100,000	8,300,000	60	36
Total	109	257,300,000	14,300,000	157,500,000	----------	----------
Washington Township						Area 31 square miles
Brookville	4	7,000,000	----------	3,500,000	50	18
Clarion	3	10,500,000	----------	6,300,000	60	36
Total	7	17,500,000	----------	9,800,000	----------	----------

CLEARFIELD COUNTY

By
John F. Reese

INTRODUCTION

Clearfield County was the first commercial producer of soft coal in Pennsylvania. For many years the celebrated Moshannon bed was the most important producer, but is now second in production, because extensive mining has made large inroads in it.

Clearfield County has between fifteen and eighteen coal beds. The most important are the Upper and Lower Freeport, Lower Kittanning and Brookville coals. The coal of this county is friable and most of it is shipped run-of-mine.

The principal mining centers are along Moshannon and Clearfield creeks and their tributaries. The coal from the southeastern two-thirds of the county goes eastward to tidewater. Practically all of the coal from the northwestern third of the county goes northward to New York and New England.

COAL BEDS

Clearfield County contains six coal beds that are now of economic interest. In order of present importance as shipping coals they are the Lower Kittanning, Lower Freeport, Upper Freeport, Upper Kittanning, Middle Kittanning and Brookville.

Lower Kittanning coal. A good number of measurements are available from the mines on this bed and from its outcrop, making possible a fairly accurate and reliable computation of quantity. In large areas no information is available as to thickness and persistency, and a general average based upon thicknesses in surrounding areas was used.

The Lower Kittanning bed contains the greatest coal resource and is the largest producer within the county, yielding more than 4,600,000 tons annually.

Lower Freeport coal. A fair quantity of information as to the thickness and persistency of the bed is available. No information as to the mined out areas of the old abandoned mines in the Philipsburg-Houtzdale area is available and this bed has been considered as practically depleted in Morris, Decatur and Woodward townships.

The Lower Freeport or "Moshannon" coal was for many years the greatest producer within the county, but as computed today is second in size of reserve, and ranks second in production with a total of over 2,900,000 tons annually.

Upper Freeport coal. The extensive outcrop of this bed throughout the county and the mines in various localities furnish enough measurements to make possible a fairly accurate estimate of quantity.

The Upper Freeport bed is third in size of reserve within the county, and ranks third in production with a total of over 530,000 tons annually.

Upper Kittanning coal. A fair quantity of information as to thickness of this bed was obtained from mines and its outcrop. Little is known as to its thickness and extent in large areas, and only proven areas around mines and drill holes have been computed in this report.

The Upper Kittanning bed is fourth in size of reserve within the county and ranks fourth in production with a total of over 200,000 tons annually.

Middle Kittanning coal. Data are meagre as to thickness and extent of this bed, and only proven areas contiguous to mines and drill holes have been considered.

The Middle Kittanning bed is sixth in size of reserve within the county and ranks fifth in production with a total of over 150,000 tons annually.

Brookville coal. This bed is computed as of economic interest in the townships bordering on Moshannon Creek, in the eastern part of the county and in several others where it is being mined or has been proven by prospecting. The Brookville coal is fifth in quantity of coal within the county and ranks sixth in production with a total of over 140,000 tons annually.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the order following: Lower Kittanning, Lower Freeport, Upper Freeport, Upper Kittanning, Middle Kittanning, and Brookville. Thus, although the figures for the Lower Kittanning bed are conservative and probably reliable, the figures for the Brookville coal may be much too small or many times too large.

Coal resources in Clearfield County

Bed	Original Deposit	Mined Out	Recoverable
Upper Freeport	446,200,000	4,690,000	234,500,000
Lower Freeport	1,075,700,000	197,800,000	537,500,000
Upper Kittanning	425,500,000	4,160,000	224,200,000
Middle Kittanning	192,100,000	1,140,000	106,800,000
Lower Kittanning	1,509,600,000	98,790,000	855,300,000
Brookville	342,900,000	1,630,000	207,100,000
Total	3,992,000,000	308,210,000	2,165,400,000

Summary of recoverable coal in Clearfield County

Township	U. Freeport	L. Freeport	U. Kittanning	M. Kittanning	L. Kittanning	Brookville
Beccaria	22,700,000	31,600,000	6,300,000	5,200,000	63,900,000	----
Bell	24,400,000	53,800,000	47,800,000	2,500,000	44,700,000	9,300,000
Bigler	11,800,000	18,800,000	8,600,000	10,400,000	25,400,000	12,700,000
Bloom	2,000,000	6,900,000	----	----	----	1,100,000
Boggs	----	2,200,000	1,700,000	----	20,300,000	3,100,000
Bradford	----	3,900,000	----	8,900,000	26,200,000	----
Brady	4,900,000	63,400,000	9,600,000	6,800,000	41,100,000	----
Burnside	25,900,000	48,400,000	17,200,000	10,400,000	10,200,000	----
Chest	24,300,000	33,900,000	37,300,000	21,400,000	43,200,000	----
Cooper	----	----	----	----	25,000,000	29,800,000
Covington	----	----	----	----	19,600,000	----
Decatur	11,000,000	7,500,000	21,500,000	12,600,000	71,700,000	53,900,000
Ferguson	10,400,000	15,000,000	10,700,000	1,300,000	6,700,000	----
Girard	9,300,000	6,400,000	----	----	28,300,000	----
Goshen	1,900,000	3,500,000	----	----	16,100,000	----
Graham	----	1,900,000	----	----	29,000,000	3,200,000
Greenwood	6,100,000	9,500,000	8,400,000	----	2,500,000	2,700,000
Gulich	16,200,000	20,100,000	2,100,000	2,100,000	48,400,000	17,900,000
Huston	----	----	----	----	70,700,000	----
Jordan	20,100,000	29,900,000	24,000,000	9,300,000	31,500,000	----
Karthaus	----	4,800,000	----	----	11,000,000	----
Knox	10,600,000	22,900,000	1,600,000	3,400,000	31,700,000	----
Lawrence	3,000,000	14,700,000	2,100,000	7,100,000	28,700,000	----
Morris	3,200,000	600,000	6,700,000	3,400,000	28,000,000	30,400,000
Penn	10,300,000	31,200,000	----	----	3,800,000	6,000,000
Pike	6,400,000	18,600,000	5,300,000	----	7,600,000	2,900,000
Pine	----	----	----	----	3,200,000	----
Sandy	----	72,100,000	3,700,000	----	56,000,000	----
Union	----	12,000,000	----	----	20,000,000	----
Woodward	10,000,000	3,900,000	9,600,000	2,000,000	37,800,000	34,100,000
Total	234,500,000	537,500,000	224,200,000	106,800,000	855,300,000	207,100,000

Coal resources in Clearfield County by townships

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Beccaria Township				Area 38.1 square miles			
U. Freeport	16.4	44,700,000	60,000	22,700,000	60	15	24–48
L. Freeport	19.9	55,300,000	2,100,000	31,600,000	70	15	24–38
U. Kittanning	4.0	10,700,000	60,000	6,300,000	70	15	0–42
M. Kittanning	3.0	8,900,000		5,200,000	70	15	0–36
L. Kittanning	26.3	99,900,000	5,900,000	63,900,000	80	15	24–70
Total		219,500,000	8,120,000	129,700,000			
Bell Township				Area 53.7 square miles			
U. Freeport	14.7	48,000,000		24,400,000	60	15	24–50
L. Freeport	28.5	80,400,000	1,200,000	53,800,000	80	15	25–46
U. Kittanning	30.5	81,000,000	500,000	47,800,000	70	15	0–40
M. Kittanning	2.0	5,000,000		2,500,000	60	15	0–30
L. Kittanning	29.0	75,400,000	30,000	44,700,000	70	15	0–46
Brookville	6.5	18,400,000		9,300,000	60	15	0–48
Total		308,200,000	1,730,000	182,500,000			
Bigler Township				Area 23.2 square miles			
U. Freeport	7.1	19,900,000		11,800,000	70	15	24–48
L. Freeport	10.1	46,900,000	19,150,000	18,800,000	80	15	24–60
U. Kittanning	6.0	14,500,000		8,600,000	70	15	0–36
M. Kittanning	6.5	17,700,000	60,000	10,400,000	70	15	0–36
L. Kittanning	14.4	51,600,000	8,800,000	25,400,000	70	15	24–58
Brookville	8.0	21,900,000	400,000	12,700,000	70	15	0–46
Total		172,500,000	28,410,000	87,700,000			
Bloom Township				Area 20.0 square miles			
U. Freeport	1.2	3,400,000		2,000,000	70	15	0–32
L. Freeport	2.1	10,200,000		6,900,000	80	15	30–60
Brookville	1.0	2,300,000		1,100,000	60	15	0–42
Total		15,900,000		10,000,000			
Boggs Township				Area 31.0 square miles			
L. Freeport	1.6	4,400,000		2,200,000	60	15	30–32
U. Kittanning	1.5	3,500,000		1,700,000	60	15	0–30
L. Kittanning	12.0	40,000,000	100,000	20,300,000	60	15	30–44
Brookville	2.0	6,200,000		3,100,000	60	15	0–36
Total		54,100,000	100,000	27,300,000			
Bradford Township				Area 36.8 square miles			
L. Freeport	2.5	6,700,000	20,000	3,900,000	70	15	0–30
M. Kittanning	5.0	15,100,000	100,000	8,900,000	70	15	30–36
L. Kittanning	13.0	45,400,000	1,300,000	26,200,000	70	15	24–56
Total		67,200,000	1,420,000	39,000,000			

Coal resources in Clearfield County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Brady Township							Area 45.7 square miles
U. Freeport	2.6	8,400,000		4,900,000	70	15	0–48
L. Freeport	22.3	116,400,000	23,100,000	63,400,000	80	15	30–78
U. Kittanning	7.5	19,000,000		9,600,000	60	15	0–30
M. Kittanning	4.0	11,500,000	30,000	6,800,000	70	15	0–34
L. Kittanning	33.0	80,700,000	60,000	41,100,000	60	15	24–34
Total		236,000,000	23,190,000	125,800,000			
Burnside Township							Area 45.1 square miles
U. Freeport	19.0	50,900,000	30,600	25,900,000	60	15	0–44
L. Freeport	26.3	82,300,000	930,000	48,400,000	70	15	24–44
U. Kittanning	11.0	33,900,000		17,200,000	60	15	0–56
M. Kittanning	8.0	20,500,000		10,400,000	60	15	0–30
L. Kittanning	10.0	20,000,000		10,200,000	60	15	0–36
Total		207,600,000	960,000	112,100,000			
Chest Township							Area 43.2 square miles
U. Freeport	17.6	47,700,000		24,300,000	60	15	0–40
L. Freeport	23.1	66,500,000		33,900,000	60	15	24–36
U. Kittanning	25.0	74,000,000	700,000	37,300,000	60	15	24–40
M. Kittanning	13.0	36,000,000		21,400,000	70	15	0–38
L. Kittanning	29.0	84,800,000		43,200,000	60	15	24–48
Total		309,000,000	700,000	160,100,000			
Cooper Township							Area 38.4 square miles
L. Kittanning	15.0	57,000,000	24,300,000	25,000,000	90	15	36–54
Brookville	12.0	35,200,000	30,000	29,800,000	70	15	0–38
Total		92,200,000	24,330,000	54,800,000			
Covington Township							Area 43.2 square miles
L. Kittanning	10.0	33,100,000		19,600,000	70	15	24–36
Decatur Township							Area 34.8 square miles
U. Freeport	8.2	22,500,000	800,000	11,000,000	60	15	0–33
L. Freeport	14.2	76,700,000	66,900,000	7,500,000	90	15	36–68
U. Kittanning	16.0	43,700,000	1,400,000	21,500,000	60	15	24–36
M. Kittanning	8.0	21,400,000	200,000	12,600,000	70	15	0–34
L. Kittanning	29.0	108,500,000	3,000,000	71,700,000	80	15	24–46
Brookville	27.0	90,700,000	100,000	53,900,000	70	15	0–42
Total		363,500,000	72,400,000	178,200,000			

Coal resources in Clearfield County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Ferguson Township							Area 17.7 square miles
U. Freeport	7.9	20,400,000		10,400,000	60	15	24-46
L. Freeport	9.0	25,500,000	200,000	15,000,000	70	15	24-38
U. Kittanning	8.0	21,100,000		10,700,000	60	15	20-32
M. Kittanning	1.0	2,700,000		1,300,000	60	15	0-30
L. Kittanning	5.0	13,500,000	200,000	6,700,000	60	15	24-36
Total		83,200,000	400,000	44,100,000			
Girard Township							Area 58.5 square miles
U. Freeport	4.2	14,600,000	800,000	9,300,000	80	15	24-42
L. Freeport	4.0	10,800,000		6,400,000	70	15	30-34
L. Kittanning	16.0	47,800,000	100,000	28,300,000	70	15	30-38
Total		73,200,000	900,000	44,000,000			
Goshen Township							Area 46.4 square miles
U. Freeport	1.0	3,600,000	700,000	1,900,000	80	15	24-42
L. Freeport	2.0	5,400,000	200,000	3,500,000	80	15	30-34
L. Kittanning	10.0	27,300,000	50,000	16,100,000	70	15	30-38
Total		36,300,000	950,000	21,500,000			
Graham Township							Area 28.0 square miles
L. Freeport	1.2	3,200,000		1,900,000	70	15	24-30
L. Kittanning	14.0	48,900,000		29,000,000	70	15	30-44
Brookville	2.0	5,400,000		3,200,000	70	15	0-36
Total		57,500,000		34,100,000			
Greenwood Township							Area 18.2 square miles
U. Freeport	4.6	12,100,000		6,100,000	60	15	0-32
L. Freeport	6.0	16,300,000	160,000	9,500,000	70	15	24-36
U. Kittanning	6.0	16,500,000		8,400,000	60	15	0-32
L. Kittanning	2.0	5,000,000		2,500,000	60	15	0-30
Brookville	2.0	5,100,000		2,700,000	60	15	0-32
Total		55,300,000	160,000	29,200,000			
Gulich Township							Area 21.9 square miles
U. Freeport	11.7	31,800,000		16,200,000	60	15	0-32
L. Freeport	13.1	37,800,000	3,900,000	20,100,000	70	15	26-52
U. Kittanning	2.0	4,300,000		2,100,000	60	15	0-24
M. Kittanning	2.0	4,300,000		2,100,000	60	15	0-30
L. Kittanning	19.6	80,500,000	9,300,000	48,400,000	80	15	32-60
Brookville	8.0	30,200,000		17,900,000	70	15	0-48
Total		188,900,000	13,200,000	106,800,000			

Coal resources in Clearfield County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Huston Township							Area 60.4 square miles
L. Kittanning	36.0	116,000,000	12,000,000	70,700,000	80	15	32-36
Jordan Township							Area 22.2 square miles
U. Freeport	12.2	34,500,000	600,000	20,100,000	70	15	24-48
L. Freeport	17.0	50,800,000	500,000	29,900,000	70	15	24-60
U. Kittanning	17.0	47,300,000	200,000	24,000,000	60	15	20-46
M. Kittanning	6.5	18,300,000	---	9,300,000	60	15	0-38
L. Kittanning	18.9	55,800,000	2,700,000	31,500,000	70	15	30-48
Total	---	206,700,000	4,000,000	114,800,000	---	---	---
Karthaus Township							Area 38.8 square miles
L. Freeport	2.6	8,200,000	20,000	4,800,000	70	15	30-44
L. Kittanning	4.5	16,700,000	500,000	11,000,000	80	15	36-42
Total	---	24,900,000	520,000	15,800,000	---	---	---
Knox Township							Area 25.5 square miles
U. Freeport	8.3	20,900,000	100,000	10,600,000	60	15	24-58
L. Freeport	11.6	38,700,000	20,000	22,900,000	70	15	24-50
U. Kittanning	1.5	3,200,000	---	1,600,000	60	15	0-24
M. Kittanning	2.5	6,700,000	---	3,400,000	60	15	0-34
L. Kittanning	16.5	54,700,000	3,600,000	34,700,000	80	15	30-44
Total	---	124,200,000	3,720,000	73,200,000	---	---	---
Lawrence Township							Area 83.6 square miles
U. Freeport	3.0	6,000,000	---	3,000,000	60	15	0-30
L. Freeport	11.4	32,500,000	10,800,000	14,700,000	80	15	24-40
U. Kittanning	2.0	4,300,000	---	2,100,000	60	15	0-30
M. Kittanning	5.0	14,200,000	150,000	7,100,000	60	15	0-34
L. Kittanning	17.0	48,500,000	100,000	28,700,000	70	15	30-36
Total	---	105,500,000	11,050,000	55,600,000	---	---	---
Morris Township							Area 17.9 square miles
U. Freeport	2.5	6,300,000	800,000	3,200,000	70	15	0-30
L. Freeport	4.9	22,200,000	21,300,000	600,000	90	15	36-60
U. Kittanning	5.0	14,000,000	800,000	6,700,000	60	15	24-36
M. Kittanning	2.0	6,100,000	300,000	3,400,000	70	15	0-34
L. Kittanning	15.8	62,500,000	25,800,000	28,000,000	90	15	36-54
Brookville	16.0	51,400,000	300,000	30,400,000	70	15	0-38
Total	---	162,500,000	49,300,000	72,300,000	---	---	---

Coal resources in Clearfield County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Penn Township					Area 26.0 square miles		
U. Freeport	6.6	17,900,000	500,000	10,300,000	70	15	0–34
L. Freeport	15.3	52,800,000	200,000	31,200,000	70	15	24–66
L. Kittanning	3.0	7,500,000		3,800,000	60	15	0–30
Brookville	4.5	11,800,000		6,000,000	60	15	0–42
Total		90,000,000	700,000	51,300,000			
Pike Township					Area 41.5 square miles		
U. Freeport	5.7	12,700,000		6,400,000	60	15	0–28
L. Freeport	10.2	35,800,000	4,500,000	18,600,000	70	15	24–48
U. Kittanning	4.5	10,400,000		5,300,000	60	15	0–30
L. Kittanning	6.6	15,100,000	50,000	7,600,000	60	15	0–36
Brookville	2.5	5,800,000		2,900,000	60	15	0–26
Total		79,800,000	4,550,000	40,800,000			
Pine Township					Area 28.1 square miles		
L. Kittanning	2.0	6,400,000		3,200,000	60	15	30–36
Sandy Township					Area 45.4 square miles		
L. Freeport	30.0	128,700,000	7,500,000	72,100,000	70	15	0–64
U. Kittanning	3.0	7,400,000	100,000	3,700,000	60	15	0–30
L. Kittanning	43.0	110,300,000		56,000,000	60	15	24–36
Total		246,400,000	7,600,000	131,800,000			
Union Township					Area 27.8 square miles		
L. Freeport	6.4	20,300,000		12,000,000	70	15	0–40
L. Kittanning	14.0	40,200,000		20,000,000	60	15	24–36
Total		60,500,000		32,000,000			
Woodward Township					Area 21.1 square miles		
U. Freeport	6.8	19,900,000	300,000	10,000,000	60	15	30–24
L. Freeport	8.1	40,900,000	35,100,000	3,900,000	80	15	36–60
U. Kittanning	6.0	16,700,000	400,000	9,600,000	70	15	24–36
M. Kittanning	1.5	3,700,000	300,000	2,000,000	70	15	0–30
L. Kittanning	15.2	56,500,000	900,000	37,800,000	80	15	30–50
Brookville	16.0	58,200,000	800,000	34,100,000	70	15	0–60
Total		195,900,000	37,800,000	97,400,000			

CLINTON COUNTY

By
James D. Sisler

INTRODUCTION

The lower part of the Allegheny group and the Pottsville series are the only coal-bearing rocks in Clinton County. These rocks are confined to three structural basins which cross the county in a general northeast-southwest direction. The coal areas are small, and confined to the highest points in these basins. Because the coal areas are small and segregated and information is meager, it is not deemed advisable to attempt to calculate the coal resources by townships. Production is small, and very little prospecting has been done.

COAL BEDS

The Pottsville series contains four coal beds. The Upper Alton coal is the only one which is considered as mineable in Clinton County.

The coals of the Allegheny group in Clinton County have not been definitely correlated. The coal geologically lowest is probably the Brookville. The bed is mined in Bald Eagle Township, where it ranges from 3 to 5 feet thick, its only distinct impurity being a thin bone parting near the top. The coal is rather high in sulphur. North of Susquehanna River in the Tangascootack basin, it averages 3 feet thick, and has fair quality. The bed ranges from 2 to 4 feet thick in the Renova basin, and is generally split near the middle by a 1-inch bone parting.

A coal lying about 70 feet above the Brookville is probably the Lower Kittanning. This bed ranges from 4 inches to 4 feet thick in the Tangascootack basin, and is extremely irregular. A coal which is probably the same bed, is mined at Bitumen where it ranges from 3 feet 6 inches to 5 feet 2 inches thick, averaging 4 feet 4 inches. The topmost coal of the Allegheny group contained in the tops of the highest hills in the basins is probably the Middle Kittanning. It is generally 4 feet 6 inches thick, but not all of the bed is mineable.

COAL RESOURCES

The following table gives the estimated quantity of coal in the original deposit, quantity mined out and lost, and the quantity recoverable. The largest quantity of recoverable coal is in the Brookville bed. The Lower Kittanning is second and the Alton or Mercer, third. The Middle Kittanning is 50 per cent recoverable, the Lower Kittanning, 55 per cent, the Brookville 55 per cent, and the Alton or Mercer, 60 per cent.

Summary of coal resources in Clinton County

Bed	Area (Sq. mi.)	Original deposit	Mined out and lost	Recoverable
M. Kittanning	2	6,380,000		3,190,000
L. Kittanning	8	34,560,000	3,721,000	16,961,000
Brookville	12	43,200,000	8,500,000	19,085,000
Alton or Mercer	14	30,240,000	5,000,000	15,344,000
Total		114,380,000	17,221,000	54,580,000

ELK COUNTY

By
James D. Sisler

INTRODUCTION

Elk County lies on the northern edge of the main bituminous coal field of Pennsylvania. It is the largest producer of bituminous coal in northern Pennsylvania. Mining has been carried on on a small scale in this county for many years. St. Marys is one of the earliest seats of coal mining in northern Pennsylvania.

The coal-bearing rocks lie nearly flat and cap the plateau along the axis of four minor synclines. These structural basins have a northeast-southwest trend. The first of these follows Bennetts Branch of the Susquehanna near Caledonia and Benezette. The second passes through Shamut and Brockport and extends along Little Toby and Elk creeks; the third lies near Lake City, Ridgway, and St. Moran; the fourth follows the same general direction through Spring Creek, Summit, and Highland. The coals of the Allegheny group and the Pottsville series have been preserved in these basins. The land between them is barren of coal and is formed of Mauch Chunk and Pottsville rocks.

COAL BEDS

Lower Kittanning coal. The Lower Kittanning, locally known as the Dagus coal, is the most important bed in the county. Most of the coal which has been mined has come from this bed. It has produced between 15 and 20 million tons. This bed ranges from 2 to 5 feet thick, averaging approximately 3 feet. It is mined extensively in Benezette and Jay townships. The Lower Kittanning is also mined extensively at Kersey, Dagus, and Toby Mines in Fox Township near the locality from which it derives its local name. The bed is rarely entirely clean. It carries numerous streaks of bone and pyrite. However, when clean it is an excellent steam and domestic fuel.

Clermont coal. Clermont is the local name of a coal bed, of which the Geological Survey has not definitely established its correlation. It is probably the equivalent of the Clarion coal of Clarion County.

There are reasons also for classing this coal as the Brookville. Until further detailed work is done its correlation will remain uncertain. The Clermont coal lies at an average interval of 80 feet below the Lower Kittanning. Its quality is variable, and very little coal has been mined from it. It is, however, a valuable resource for future mining. In Benezette, Fox, and Jay townships the Clermont coal ranges from 2 feet to 5 feet 3 inches thick. Where thickest it generally carries 2 or 3 bone partings. It is mined quite extensively in Benzinger Township and in the vicinity of St. Marys is 3 feet thick, including 6 inches of bone coal 6 inches from the top.

Lower Freeport coal. The Lower Freeport is thin and unimportant in practically all of Elk County. It is, however, thick enough to be mined at some future time. Probably its greatest value is in Horton and Fox townships. Here it is 3 feet to 4 feet 6 inches thick and is practically without visible partings and binders. Its greatest future value is in these two townships.

Upper Freeport coal. The Upper Freeport, lying about 45 feet above the Lower Freeport, has been largely eroded and occurs only in the hilltops of the four basins, described at the beginning of this chapter. The Upper Freeport has an average thickness of about 6 feet. The entire bed is not mineable because of bad roof conditions. Where thickest the bed is usually divided into three benches by two bone partings of variable thickness. Because of its accessibility this bed has been mined for local fuel. The Survey has no record of any commercial mines in this bed.

COAL RESOURCES

The following tables give a complete summary of the quantity of recoverable coal in the ground, the original deposit, and the quantity of coal mined out and lost.

The information concerning coal beds of Elk County is meagre. Although records are available concerning the commercial mines in this district, very little information is to be had concerning the country banks, as mapping the detailed geology of this county has not been started.

Horton Township contains the largest quantity of unmined coal. Fox Township is second, and Jay is third. The largest recoverable tonnage is in the Alton beds. This tonnage is somewhat misleading because of adverse mining conditions which will be encountered when these beds are worked. The most valuable tonnage is in the Clermont and the Lower Kittanning beds.

Coal resources in Elk County

Bed	Original deposit	Mined out	Recoverable
Upper Freeport	4,465,000	1,700,000	2,083,000
Lower Freeport	14,400,000	7,900,000	5,005,000
Lower Kittanning	63,297,000	30,100,000	24,464,000
Clermont (Clarion)	173,932,000	14,575,000	117,858,000
Alton (Mercer)	303,687,000	500,000	151,063,000
Total	559,781,000	54,775,000	300,473,000

Summary of recoverable coal in Elk County

Township	Alton	Clermont	Lower Kittanning	Lower Freeport	Upper Freeport
Benezette	1,002,000	274,000	152,000		
Benzinger	20,412,000	11,960,000	1,204,000		
Fox	18,040,000	37,731,000	6,428,000	1,540,000	633,000
Highland	19,359,000				
Horton	14,490,000	41,165,000	11,605,000	3,465,000	1,450,000
Jay	14,650,000	6,100,000	349,000		
Jones	27,776,000	18,876,000	4,726,000		
Millstone	144,000				
Ridgway	21,330,000	1,752,000			
Spring Creek	13,860,000				
Total	151,063,000	117,858,000	24,464,000	5,005,000	2,083,000

Coal resources in Elk County by townships

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Average thickness (inches)
Benezette Township				Area 116.21 square miles		
Alton	8.0	1,440,000		576,000	40	20
Clermont	3.0	648,000	100,000	274,000	50	24
L. Kittanning	2.0	504,000	200,000	152,000	50	28
Total		2,592,000	300,000	1,002,000		
Benzinger Township				Area 96.6 square miles		
Alton	25.2	40,824,000		20,412,000	50	18
Clermont	6.1	20,862,000	4,700,000	11,960,000	74	38
L. Kittanning	1.1	3,564,000	2,000,000	1,204,000	77	36
Total		65,250,000	6,700,000	33,576,000		

Coal resources in Elk County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recover-able	Average thickness (inches)
Fox Township						Area 64.16 square miles
Alton	21.1	36,081,000		18,040,000	50	19
Clermont	16.1	52,164,000	1,175,000	37,731,000	74	[illegible]
L. Kittanning	5.9	19,647,000	10,000,000	6,428,000	77	37
L. Freeport	1.0	3,600,000	1,600,000	1,540,000	77	40
U. Freeport	.5	1,630,000	700,000	633,000	79	34
Total		113,122,000	13,475,000	64,372,000		
Highland Township						Area 84.92 square miles
Alton	23.9	38,718,000		19,359,000	50	13
Total		38,718,000		19,359,000		
Horton Township						Area 53.20 square miles
Alton	16.1	28,980,000		14,490,000	50	20
Clermont	17.2	55,728,000	100,000	41,165,000	74	36
L. Kittanning	7.8	25,272,000	10,200,000	11,605,000	77	36
L. Freeport	3.0	10,800,000	6,300,000	3,465,000	77	40
U. Freeport	1.5	2,835,000	1,000,000	1,450,000	79	36
Total		123,615,000	17,600,000	72,175,000		
Jay Township						Area 64.12 square miles
Alton	16.5	29,700,000		14,650,000	50	20
Clermont	3.2	10,944,000	2,700,000	6,100,000	74	38
L. Kittanning	.3	972,000	500,000	349,000	74	36
Total		41,616,000	3,200,000	21,099,000		
Jones Township						Area 135.2 square miles
Alton	34.6	56,052,000	500,000	27,776,000	50	18
Clermont	9.2	29,808,000	4,300,000	18,876,000	74	36
L. Kittanning	3.9	13,338,000	7,200,000	4,726,000	77	38
Total		99,198,000	12,000,000	51,378,000		
Millstone Township						Area 42.64 square mlies
Alton	10	360,000		144,000	40	20
Total		360,000		144,000		

Coal resources in Elk County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Average thickness (inches)
Ridgway Township						Area 89.8 square miles
Alton	23.7	42,660,000		21,330,000	50	20
Clermont	1.3	3,778,000	1,500,000	1,752,000	77	18
Total		46,438,000	1,500,000	23,082,000		
Spring Creek Township						Area 50 square miles
Alton	15.4	27,720,000		13,860,000	50	20
Total		27,720,000		13,860,000		

FAYETTE COUNTY

By
John F. Reese

INTRODUCTION

Fayette County has produced coal since 1759, and is noted for the quantity of its coking coal. The Pittsburgh bed, the source of this coal, has been so important that other coal beds have been worked but little. With the steadily approaching exhaustion of the Pittsburgh bed, these other coals will come into importance, and finally bear the entire burden of mining.

Very little detailed information is available concerning the thickness and chemical quality of the beds beneath the Pittsburgh, particularly where they do not outcrop, and those in areas far distant from railroads. In calculating the contents of these beds only an estimate could be made. A new computation will be made when additional information is available.

COAL BEDS

Fayette County has seven coal beds which are considered of economic value at the present time. In order of importance as shipping coals they are: the Pittsburgh, Sewickley, Upper Kittanning, Lower Kittanning, Upper Freeport, Waynesburg, and Redstone.

Pittsburgh coal. The extensive development of this bed and its outcrop throughout the county have furnished many measurements of its thickness, making possible an accurate and reliable computation of quantity. For some localities no information is available concerning the size of mined-out areas. An estimate of probable depletion has been based upon the age of development and the size of surrounding operations in these particular sections or on the difference between original areas and statements of areas unmined.

Sewickley coal. The outcrop and development of this bed have made possible many reliable measurements of thickness. The Sewickley is considered of value as a shipping coal in eight townships. Many mines have been opened in this bed in recent years, and its economic value as a producer of fuel for industrial purposes is second to that of the Pittsburgh coal.

Upper Kittanning coal. A fair quantity of data regarding the thickness of this bed has been gathered from the mines and the outcrop along Youghiogheny River in the Confluence-Indian Creek region. It has been considered and calculated as of economic value only in Stewart and Henry Clay townships. Future development and prospecting may show that it is mineable in other townships west of Chestnut Ridge.

Lower Kittanning coal. The development and prospecting of this coal in the Confluence-Indian Creek region have furnished a fair number of measurements of thickness. It has been computed as of economic value in four townships, namely Saltlick, Springfield, Stewart, and Henry Clay. Future prospecting may show that it is mineable in other townships.

Upper Freeport coal. This bed contains the greatest coal resource in the county. Its extensive outcrop along Chestnut and Laurel ridges gives numerous opportunities for measurements, making fairly reliable computation of quantity possible. It is assumed that the continuity of this bed is unbroken from the west slope of Chestnut Ridge to Monongahela River. Core drill holes along the river prove its existence in that region. The tonnage computations are based upon many measurements along the outcrop and upon an assumed thickness of 42 inches in the townships bordering the river.

Because of the known variability in thickness of the bed, a conservative estimate of the percentage recoverable by mining has been used in computing the tonnage. This bed will assume greater importance as a shipping coal in the near future because of the rapid depletion of the Pittsburgh coal.

Waynesburg coal. A fairly reliable estimate of quantity is made possible by the number of measurements along the extensive outcrop of this bed. Because of its accessibility the Waynesburg coal is mined at many places throughout the county for local use. This bed is badly broken by partings but where the thickness is fairly uniform, there are several mines that are shipping it for industrial purposes. Because of the character of the bed, however, it will not become a large producer of shipping coal, and it will be of less economic value than any of the beds whose quantity has been computed.

Redstone coal. The outcrop and shaft sections give a fair idea of the extent and thickness of this coal. It is not mined for shipment, but is used for domestic purposes in several localities.

A conservative percentage of recovery has been used in computing the tonnage of this bed because when the large Pittsburgh bed underneath is mined out, the Redstone bed will be badly broken by caving of the intervening rocks. For this reason it will never be a great producer although available information shows it to be of good thickness.

As the Pittsburgh bed approaches exhaustion, operations which have pierced this bed with their shafts may develop and mine such of this coal as is available, thereby giving the coal a greater economic value than it now has.

Other coal beds are mined for local use but they are not important, and little is known of their extent and thickness They have not been included in the computation of the reserves.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the following order: Pittsburgh, Sewickley, Waynesburg, Freeport, Upper Kittanning, Lower Kittanning, Redstone. Thus, while the figures for the Pittsburgh bed are conservative and probably reliable, the figures for the Freeport, Kittanning, and Redstone coals may be much too small or many times too large in various townships.

Coal resources in Fayette County

Bed	Original deposit	Mined out	Recoverable
Waynesburg	316,854,000	3,216,000	199,800,000
Sewickley	194,175,000	10,132,000	123,600,000
Redstone	151,380,000	----------	75,700,000
Pittsburgh	2,087,772,000	878,030,000	919,300,000
Freeport	2,088,153,000	1,650,000	1,029,000,000
U. Kittanning	89,280,000	2,016,000	59,000,000
L. Kittanning	302,120,000	4,500,000	198,000,000
Total	5,229,734,000	899,544,000	2,604,400,000

Summary of recoverable coal in Fayette County

Township	L. Kittanning	U. Kittanning	Freeport	Pittsburgh	Redstone	Sewickley	Waynesburg
Brownsville			4,000,000	6,900,000			1,000,000
Bullskin			35,700,000	5,600,000			
Connellsville City			2,400,000	1,300,000			
Connellsville			13,400,000	4,900,000			
Dunbar			91,500,000	72,700,000		28,300,000	15,000,000
Franklin			67,000,000	12,200,000		2,400,000	7,600,000
Georges			87,000,000	49,700,000	3,600,000	24,600,000	
German			56,000,000	121,300,000			28,000,000
Henry Clay	32,000,000	34,000,000	23,000,000				
Jefferson			34,000,000	75,600,000	24,700,000		15,600,000
Lower Tyrone			40,000,000	5,600,000			
Luzerne			48,000,000	200,000,000			47,800,000
Menallen			43,000,000	23,500,000			3,000,000
Nicholson			33,000,000	27,600,000		3,000,000	
North Union			85,000,000	57,500,000	19,800,000	35,000,000	12,000,000
Perry			48,000,000	13,700,000	9,600,000	2,600,000	4,800,000
Redstone			40,000,000	136,000,000			61,000,000
Saltlick	60,000,000		21,000,000				
South Union			36,000,000	37,200,000	8,000,000	23,000,000	1,000,000
Springfield	86,000,000		12,000,000				
Springhill			43,000,000	26,000,000		1,400,000	
Stewart	20,000,000	25,000,000	16,000,000				
Uniontown City			3,000,000	5,300,000		3,300,000	
Upper Tyrone			21,000,000	10,000,000			
Washington			16,000,000	26,700,000	10,000,000		3,000,000
Wharton			110,000,000				
Total	198,000,000	59,000,000	1,029,000,000	919,300,000	75,700,000	123,600,000	199,800,000

Coal resources in Fayette County by townships

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Brownsville Township							Area 2.6 square miles
Pittsburgh	2.3	22,896,000	13,878,000	6,900,000	90	15	90–112
Freeport	2.6	9,828,000		4,000,000	50	15	42
Waynesburg	.3	1,566,000		1,000,000	80	15	58
Total		34,290,000	13,878,000	11,900,000			
Bullskin Township							Area 44.0 square miles
Pittsburgh	2.4	21,816,000	14,490,000	5,600,000	90	15	98–108
Freeport	14.1	60,030,000		35,700,000	70	15	30–50
Total		81,846,000	14,490,000	41,300,000			
Connellsville City							Area .9 square miles
Pittsburgh	.3	2,718,000	900,000	1,300,000	90	15	96–106
Freeport	.9	4,050,000		2,400,000	70	15	50
Total		6,768,000	900,000	3,700,000			
Connellsville Township							Area 14.1 square miles
Pittsburgh	2.1	19,656,000	13,140,000	4,900,000	90	15	96–108
Freeport	4.6	22,680,000		13,400,000	70	15	50–70
Total		42,336,000	13,140,000	18,300,000			
Dunbar Township							Area 65.8 square miles
Pittsburgh	22.9	202,626,000	107,550,000	72,700,000	90	15	94–112
Sewickley	12.0	43,200,000	1,440,000	28,300,000	80	15	40
Freeport	29.4	153,900,000		91,500,000	70	15	50–65
Waynesburg	10.0	36,000,000	360,000	15,000,000	50	51	40
Total		435,726,000	109,350,000	207,500,000			
Franklin Township							Area 30.3 square miles
Pittsburgh	7.3	64,026,000	48,078,000	12,200,000	90	15	90–108
Sewickley	1.0	3,600,000		2,400,000	80	15	40
Freeport	29.0	132,300,000	50,000	67,000,000	60	15	50–60
Waynesburg	.5	1,800,000		7,600,000	50	15	40
Total		201,726,000	48,128,000	89,200,000			
Georges Township							Area 49.4 square miles
Pittsburgh	16.3	151,668,000	86,616,000	49,700,000	90	15	90–108
Sewickley	7.3	39,465,000	3,150,000	24,600,000	80	15	50–65
Freeport	32.6	206,280,000		87,000,000	50	15	50–100
Redstone	2.0	7,200,000		3,600,000	60	15	40
Total		404,613,000	89,766,000	164,900,000			

Coal resources in Fayette County by townships—Continued

German Township — Area 35.2 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Pittsburgh	25.4	242,208,000	83,628,000	121,300,000	90	15	96–110
Freeport	35.2	133,056,000		56,000,000	50	15	42
Waynesburg	9.5	42,966,000	432,000	28,000,000	80	15	48–72
Total		418,230,000	84,060,000	205,300,000			

Henry Clay Township — Area 58.4 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Upper Freeport	18.0	38,880,000	50,000	23,000,000	70	15	24
Lower Kittanning	18.0	48,600,000	270,000	32,000,000	80	15	30
Upper Kittanning	18.0	51,840,000	1,440,000	34,000,000	80	15	32
Total		139,320,000	1,760,000	89,000,000			

Jefferson Township — Area 21.2 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Pittsburgh	20.4	192,996,000	94,104,000	75,600,000	90	15	90–112
Freeport	21.2	80,136,000		34,000,000	50	15	42
Redstone	18.0	48,600,000		24,700,000	60	15	30
Waynesburg	6.6	23,760,000	720,000	15,600,000	80	15	04
Total		345,492,000	94,824,000	149,900,000			

Lower Tyrone Township — Area 16.5 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Pittsburgh	1.6	15,120,000	7,668,000	5,600,000	90	15	96–108
Freeport	15.0	67,500,000		40,000,000	70	15	50
Total		82,620,000	7,668,000	45,600,000			

Luzerne Township — Area 30.2 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Pittsburgh	29.7	291,762,000	30,006,000	200,000,000	90	15	96–112
Freeport	30.2	114,156,000		48,000,000	50	15	42
Waynesburg	13.9	70,920,000	486,000	47,800,000	80	15	52–62
Total		476,838,000	30,492,000	295,800,000			

Menallen Township — Area 22.4 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Pittsburgh	9.7	87,336,000	56,628,000	23,500,000	90	15	94–108
Freeport	22.4	101,700,000		43,000,000	50	15	50–60
Waynesburg	.9	4,428,000		3,000,000	80	15	52–60
Total		193,464,000	56,628,000	69,500,000			

Nicholson Township — Area 22.0 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Pittsburgh	7.1	63,340,000	27,198,000	27,600,000	90	15	90–104
Sewickley	1.1	5,760,000	1,080,000	3,000,000	80	15	50–60
Freeport	22.0	79,200,000		33,000,000	50	15	40
Total		148,300,000	28,278,000	63,600,000			

Coal resources in Fayette County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
North Union Township							Area 32.9 square miles
Pittsburgh	17.9	164,826,000	89,586,000	57,500,000	90	15	96-130
Sewickley	12.3	53,820,000	1,980,000	35,000,000	80	15	40-60
Freeport	24.4	144,180,000		85,000,000	70	15	30-90
Redstone	12.0	38,880,000		19,800,000	60	15	36
Waynesburg	8.0	28,800,000	300,000	12,000,000	50	15	40
Total		430,506,000	91,866,000	209,300,000			
Perry Township							Area 22.2 square miles
Pittsburgh	7.7	71,586,000	53,568,000	13,700,000	90	15	86-108
Sewickley	1.0	4,320,000	432,000	2,600,000	80	15	48
Freeport	21.0	94,500,000		48,000,000	60	15	50
Redstone	7.0	18,900,000		9,600,000	60	15	30
Waynesburg	2.1	7,560,000	360,000	4,800,000	80	15	40
Total		196,866,000	54,360,000	78,700,000			
Redstone Township							Area 22.7 square miles
Pittsburgh	22.7	222,210,000	44,280,000	136,000,000	90	15	90-112
Freeport	22.7	85,806,000		40,000,000	50	15	42
Waynesburg	17.6	91,674,000	558,000	61,000,000	80	15	52-62
Total		399,690,000	44,838,000	237,000,000			
Saltlick Township							Area 40.6 square miles
U. Freeport	11.0	31,500,000	380,000	21,000,000	80	15	30
L. Kittanning	25.0	90,000,000	1,800,000	60,000,000	80	15	40
Total		121,500,000	2,180,000	81,000,000			
South Union Township							Area 17.3 square miles
Pittsburgh	7.8	76,212,000	22,122,000	37,200,000	90	15	96-108
Sewickley	6.7	36,180,000	1,080,000	23,000,000	80	15	60
Freeport	10.4	72,630,000		36,000,000	60	15	50-100
Redstone	5.0	16,200,000		8,000,000	60	15	36
Waynesburg	1.0	2,700,000		1,000,000	50	15	30
Total		203,922,000	23,202,000	105,200,000			
Springfield Township							Area 65.0 square miles
Freeport	9.0	24,300,000	540,000	12,000,000	60	15	30
L. Kittanning	34.0	128,520,000	1,890,000	86,000,000	80	15	42
Total		152,820,000	2,430,000	98,000,000			

Coal resources in Fayette County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Springhill Township							Area 32.2 square miles
Pittsburgh	5.3	44,964,000	10,188,000	26,000,000	90	15	80–96
Sewickley	.6	2,970,000	970,000	1,400,000	80	15	50–60
Freeport	25.1	102,330,000	----------	43,000,000	50	15	40–99
Total	----------	150,264,000	11,158,000	70,400,000	----------	----------	----------
Stewart Township							Area 57.6 square miles
Freeport	12.9	31,725,000	----------	16,000,000	60	15	20–45
L. Kittanning	13.0	35,000,000	540,000	20,000,000	80	15	30
U. Kittanning	13.0	37,440,000	576,000	25,000,000	80	15	32
Total	----------	104,165,000	1,116,000	61,000,000	----------	----------	----------
Uniontown City							Area 1.0 square miles
Pittsburgh	1.0	8,820,000	1,764,000	5,300,000	90	15	96–100
Sewickley	.9	4,800,000	----------	3,300,000	80	15	60
Freeport	1.0	6,300,000	----------	3,000,000	60	15	70
Total	----------	19,980,000	1,764,000	11,600,000	----------	----------	----------
Upper Tyrone Township							Area 8.0 square miles
Pittsburgh	5.3	47,430,000	34,038,000	10,000,000	90	15	96–108
Freeport	8.0	36,000,000	----------	21,000,000	70	15	50
Total	----------	83,430,000	34,038,000	31,000,000	----------	----------	----------
Washington Township							Area 10.2 square miles
Pittsburgh	8.4	73,556,000	38,600,000	26,700,000	90	15	86–108
Freeport	10.2	38,556,000	----------	16,000,000	50	15	2
Redstone	8.0	21,600,000	----------	10,000,000	60	15	30
Waynesburg	1.3	4,680,000	----------	3,000,000	80	15	40
Total	----------	138,392,000	38,600,000	55,700,000	----------	----------	----------
Wharton Township							Area 101.3 square miles
Freeport	52.3	216,630,000	630,000	110,000,000	60	15	40–70

GREENE COUNTY

By
John F. Reese

INTRODUCTION

Greene County contains one-fourth of the Pittsburgh coal in the State, and has more unmined coal than any other county. The coals beneath the Pittsburgh, in the Allegheny group, do not outcrop in the county, and little is known of their thickness and value.

Greene County has at least eight workable coals. The Pittsburgh is the only one that can be worked in large areas; the others are workable only locally. Thirty beds are known in the county with an aggregate average thickness of approximately 25 feet.

Practically all of the coal production of Greene County comes from mines along or near Monongahela River. Development of coal in the interior of the county has been hampered by lack of railroad facilities and because the Pittsburgh coal is more accessible in the river valley.

COAL BEDS

Four beds are of economic interest and have been used in calculating the quantity of coal in the ground. These beds in order of present importance are the Pittsburgh, Sewickley, Waynesburg, and Freeport.

Pittsburgh coal. The mining and prospecting of the Pittsburgh coal has furnished measurements of its thickness in several places and with data from contiguous areas in West Virginia, a fairly reliable computation of the quantity is possible. The Pittsburgh coal underlies all the county except a narrow strip on Monongahela River.

Sewickley coal. The Sewickley coal underlies practically the entire county and is exposed only in the southeast part and at the mouth of Tenmile Creek. Mines on the outcrop and data from adjacent parts of West Virginia furnish the only data for computing the tonnage. An average of 20 inches has been used in townships for which no measurements can be obtained.* This coal is thickest in the southeast part of the county and thins rapidly toward the north and west.

*This does not mean that the Geological Survey believes the coal is only 20 inches thick, but it conforms to the idea of being extremely conservative when there is a question as to the actual content of any bed.

Waynesburg coal. Numerous sections from the extensive outcrop of the Waynesburg coal and data from reports of the West Virginia Geological Survey give a fairly accurate basis for computing the thickness of this coal in each township. This bed is broken by many partings and at present is used only locally. It will not be mined extensively for commercial use until railroads are built into the county or the Pittsburgh and Sewickley beds are nearer exhaustion.

Washington coal. Besides these four beds, a fifth, known as the Washington coal, from its considerable development in the adjoining county, is of some interest. In much of the county where its horizon is exposed the bed is so thin or composed so largely of clay and shale partings that it is not mineable. In the vicinity of Ryerson Station, however, at one place the bed is 51 inches thick and contains 33 inches of coal in four benches, the thickest of which is 23 inches. It has been mined at several banks in Richhill Township, but as the main bench rarely exceeds 18 inches, this bed is not considered as an economic resource.

Freeport coal. Little is known of the Freeport coal in Greene County except that the records of churn drill holes show coal at its horizon. The thickness along Monongahela River is known from records of core drill holes. This coal lies about 600 feet below the Pittsburgh coal; it does not outcrop and so is assumed to underlie the whole county at considerable depth and with unbroken continuity. In computing the quantity a thickness of 30 inches has been used in all townships. The recoverable quantity has been estimated at 50 per cent of the whole, from which has been deducted 15 per cent for loss in mining. This bed is ranked fifth because its regularity and extent are wholly assumed. Should future prospecting show it thicker and better than has been assumed, this coal may eventually be mined in spite of its great depth, and rank higher in economic value than the dirty but more accessible Waynesburg and Washington coals.

Other coal beds than these five have been mined for local use but as they are not important, and as little is known of their extent and thickness, they have not been included in the computation of the resources.

COAL RESOURCES

The result of computing the coal resources in Greene County based on the latest maps, engineering data, and methods is shown in the following tables:

Coal resources in Greene County

Bed	Original deposit	Mined out and lost	Recoverable
Waynesburg	2,557,242,000	270,600	1,647,859,000
Sewickley	1,393,407,000	2,700,000	1,119,454,000
Pittsburgh	3,919,486,000	39,420,000	2,831,454,000
Freeport	1,594,080,000	----------	677,484,000
Total	9,464,215,000	42,390,600	6,276,251,000

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the several beds given from left to right and for the townships from east to west or from northeast to southwest. Thus, while the figures for the Pittsburgh bed are conservative and probably reliable, the figures for the Freeport coal may be much too small or many times too large.

Summary of recoverable coal in Greene County

Township	Pittsburgh	Sewickley	Waynesburg	Freeport
Aleppo	106,475,760	41,922,000	59,180,400	31,441,500
Center	224,206,200	78,030,000	141,827,175	58,522,500
Cumberland	245,342,845	77,838,750	114,255,425	46,473,750
Dunkard	166,906,170	99,488,250	36,762,075	36,949,500
Franklin	194,398,740	63,112,500	124,316,325	47,277,000
Gilmore	94,847,760	31,537,125	56,763,000	25,704,000
Greene	116,246,340	40,738,160	53,978,400	22,032,000
Jackson	119,034,000	44,370,000	85,068,000	33,277,500
Jefferson	127,937,070	41,248,800	61,419,930	26,2 7,750
Monongahela	97,711,920	49,778,550	15,353,550	20,939,250
Morgan	148,523,220	41,310,000	80,588,925	31,212,000
Morris	156,125,025	55,692,000	114,971,850	41,769,000
Perry	179,478,180	114,300,945	121,059,702	35,113,500
Richhill	228,276,350	93,024,050	167,638,275	69,768,000
Springhill	123,379,200	46,512,000	59,394,650	34,884,000
Washington	123,677,550	41,310,000	92,947,500	39,982,500
Wayne	199,106,550	99,410,220	141,525,000	47,047,500
Whiteley	179,781,120	59,830,650	120,808,800	37,752,750
Total	2,831,454,000	1,119,454,000	1,647,859,000	677,484,000

Coal resources in Greene County by townships

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (inches)
Aleppo Township							Area 27.4 square miles
Pittsburgh	27.4	156,582,000	----------	106,475,760	80	15	60-66
Sewickley	27.4	49,320,000	----------	41,922,000	100	15	20
Waynesburg	27.4	87,030,000	----------	59,180,400	80	15	30-45
Freeport	27.4	73,980,000	----------	31,441,500	50	15	30
Total	----------	366,912,000	----------	239,020,360	----------	----------	----------

Coal resources in Greene County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (inches)
Center Township				Area 51.0 square miles			
Pittsburgh	51.0	310,320,000	----------	224,206,200	85	15	62-72
Sewickley	51.0	91,800,000	----------	78,030,000	100	15	20
Waynesburg	51.0	238,365,000	----------	141,827,175	70	15	50-60
Freeport	51.0	137,700,000	----------	58,522,500	50	15	30
Total	----------	778,185,000	----------	502,585,875	----------	----------	----------
Cumberland Township				Area 40.5 square miles			
Pittsburgh	40.14	336,621,600	15,912,000	245,342,845	90	15	80-104
Sewickley	40.5	91,575,000	----------	77,838,750	100	15	25
Waynesburg	29.2	158,139,000	----------	114,255,425	85	15	50-72
Freeport	40.5	109,350,000	----------	46,473,750	50	15	30
Total	----------	695,685,000	15,912,000	483,910,770	----------	----------	----------
Dunkard Township				Area 32.2 square miles			
Pittsburgh	27.5	225,738,000	7,560,000	166,906,170	90	15	84-94
Sewickley	24.0	119,205,000	2,160,000	99,488,250	100	15	40-60
Waynesburg	12.6	61,785,000	----------	36,762,075	70	15	50-65
Freeport	32.2	86,940,000	----------	36,949,500	50	15	30
Total	----------	493,688,000	9,720,000	340,105,995	----------	----------	----------
Franklin Township				Area 41.2 square miles			
Pittsburgh	41.2	269,064,000	----------	194,398,740	85	15	68-80
Sewickley	41.2	74,250,000	----------	63,112,500	100	15	20-25
Waynesburg	38.8	208,935,000	----------	124,316,325	70	15	50-60
Freeport	41.2	111,240,000	----------	47,277,000	50	15	30
Total	----------	663,489,000	----------	429,104,565	----------	----------	----------
Gilmore Township				Area 22.4 square miles			
Pittsburgh	22.4	139,482,000	----------	94,847,760	80	15	66-72
Sewickley	22.4	43,650,000	----------	31,537,125	85	15	20-40
Waynesburg	22.4	83,475,000	----------	56,763,000	80	15	35-45
Freeport	22.4	60,480,000	----------	25,704,000	50	15	30
Total	----------	327,087,000	----------	208,851,885	----------	----------	----------
Greene Township				Area 19.2 square miles			
Pittsburgh	19.2	151,956,000	----------	116,246,340	90	15	80-94
Sewickley	19.2	56,385,000	----------	40,738,160	85	15	25-30
Waynesburg	16.2	79,380,000	----------	53,978,400	80	15	50-60
Freeport	19.2	51,840,000	----------	22,032,000	50	15	30
Total	----------	339,561,000	----------	232,994,900	----------	----------	----------
Jackson Township				Area 29.0 square miles			
Pittsburgh	29.0	175,050,000	----------	119,034,000	80	15	66-72
Sewickley	29.0	52,200,000	----------	44,370,000	100	15	20
Waynesburg	29.0	125,100,000	----------	85,068,000	80	15	40-60
Freeport	29.0	78,300,000	----------	33,277,500	50	15	30
Total	----------	430,650,000	----------	281,749,500	----------	----------	----------

Coal resources in Greene County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (inches)
Jefferson Township							Area 22.9 square miles
Pittsburgh	22.0	168,930,000	1,692,000	127,937,070	90	15	80–108
Sewickley	22.0	48,528,000		41,248,800	100	15	20–25
Waynesburg	18.2	96,345,000		61,419,930	75	15	50–60
Freeport	22.9	61,830,000		26,277,750	50	15	30
Total		375,633,000	1,692,000	256,883,550			
Monongahela Township							Area 18.3 square miles
Pittsburgh	16.75	141,264,000	13,536,000	97,711,920	90	15	92–100
Sewickley	15.5	65,610,000	540,000	49,778,550	90	15	25–60
Waynesburg	4.1	20,070,000		15,353,550	80	15	50–55
Freeport	18.3	49,410,000		20,999,250	50	15	30
Total		276,354,000	14,076,000	183,843,270			
Morgan Township							Area 27.2 square miles
Pittsburgh	27.2	194,868,000	720,000	148,523,220	90	15	72–84
Sewickley	26.6	48,600,000		41,310,000	100	15	20–25
Waynesburg	22.9	126,414,000		80,588,925	75	15	48–90
Freeport	27.2	73,440,000		31,212,000	50	15	30
Total		443,322,000	720,000	301,634,145			
Morris Townsip							Area 36.4 square miles
Pittsburgh	36.4	216,090,000		156,125,025	85	15	62–68
Sewickley	36.4	65,520,000		55,692,000	100	15	20
Waynesburg	36.4	193,230,000		114,971,850	70	15	55–60
Freeport	36.4	98,280,000		41,769,000	50	15	30
Total		573,120,000		368,557,875			
Perry Township							Area 30.6 square miles
Pittsburgh	30.6	234,612,000		179,478,180	90	15	76–92
Sewickley	30.6	158,202,000		114,300,945	85	15	30–68
Waynesburg	28.4	178,029,000		121,059,720	80	15	55–100
Freeport	30.6	82,620,000		35,113,500	50	15	30
Total		653,463,000		449,952,345			
Richhill Township							Area 60.8 square miles
Pittsburgh	60.8	335,700,000		228,276,250	80	15	58–66
Sewickley	60.8	109,440,000		93,024,050	100	15	20
Waynesburg	60.2	282,015,000	270,000	167,638,275	70	15	30–60
Freeport	60.8	164,160,000		69,768,000	100	15	30
Total		891,315,000	270,000	573,225,675			
Springhill Township							Area 30.4 square miles
Pittsburgh		181,440,000		123,379,200	80	15	62–68
Sewickley	30.4	54,720,000		46,512,000	100	15	20
Waynesburg	30.4	87,345,000		59,394,650	80	15	30–40
Freeport	30.4	82,080,000		34,884,000	50	15	30
Total		405,585,000		264,169,850			

Coal resources in Greene County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (inches)
Washington Township							Area 27.0 square miles
Pittsburgh	27.0	171,180,000	----------	123,677,550	85	15	68-76
Sewickley	27.0	48,600,000	----------	41,310,000	100	15	20
Waynesburg	27.0	145,800,000	----------	92,947,500	75	15	60
Freeport	27.0	72,900,000	----------	30,9 2,500	50	15	30
Total	----------	438,480,000	----------	288,917,550	----------	----------	----------
Wayne Township							Area 41.0 square miles
Pittsburgh	41.0	275,580,000	----------	199,106,550	85	15	68-84
Sewickley	41.0	137,592,000	----------	99,410,220	85	15	20-68
Waynesburg	41.0	208,125,000	----------	141,525,000	80	15	45-80
Freeport	41.0	110,700,000	----------	47,047,500	50	15	30
Total	----------	731,997,000	----------	487,089,270	----------	----------	----------
Whiteley Township							Area 32.9 square miles
Pittsburgh	32.9	235,008,000	----------	179,781,120	90	15	72-88
Sewickley	32.9	78,210,000	----------	59,830,650	90	15	20-40
Waynesburg	32.9	177,660,000	----------	120,808,800	80	15	60
Freeport	32.9	88,830,000	----------	37,752,750	50	15	30
Total	----------	579,708,000	----------	398,173,320	----------	----------	----------

INDIANA COUNTY

By
John F. Reese

INTRODUCTION

Indiana County, situated near the center of the bituminous coal field, has for many years been one of the most important bituminous coal-producing counties in Pennsylvania. The greater part of the coal is mined from the Upper Freeport bed, which is the largest resource of valuable and easily accessible coal in the county. The Lower Freeport, Lower Kittanning, and Pittsburgh beds are important locally as sources of shipping coal.

The thick coal beds of the Allegheny group, including the Kittannings and Freeports, are large reserves for future use. Practically all the mining is drift, although there are extensive areas where good coal is easily accessible by shaft or slope. Mining towns are scattered throughout the county where mining conditions are favorable.

COAL BEDS

Indiana County has four coal beds that are now of economic interest. In order of present importance as shipping coals they are the Upper Freeport, Lower Freeport, Lower Kittanning, and Pittsburgh.

Upper Freeport coal. The extensive development and outcrop of this bed throughout the county, and several core drill records have furnished so many measurements of its thickness that it is possible to make a fairly accurate computation of its content.

Data are meager in the Mahoning townships in the northwestern part of the county, and in Young, Blacklick, and Conemaugh townships in the southwestern part. The computations for these townships are based on general average thicknesses in accord with conditions in surrounding townships.

The percentage of this bed that can be recovered is governed by the sequence in which the Upper and Lower Freeport beds are mined. If the Lower Freeport bed is worked first and if pillars are drawn,

the overlying rocks will cave and break the Upper Freeport bed, thereby causing a partial and in many places complete loss of that coal.

The Upper Freeport bed contains the greatest coal resource within the county, and is the largest producer, yielding almost 5,000,000 tons annually.

Lower Freeport coal. The computation of tonnage in this bed is based on measurements made in the mines and along the outcrop, and on core drill records. The figures are reliable.

In the Mahoning townships in the northwestern part of the county, and in the townships along the Conemaugh and Kiskiminitas rivers, very little information was available as to the extent and persistence of this bed. A general average thickness was assumed, which was derived from surrounding areas where reliable data are available.

The so-called Upper Kittanning or C′ bed in the northern part of the county in Banks and Montgomery townships, has been computed as the Lower Freeport coal in this report.

The Lower Freeport contains the second greatest resource within the county, and ranks second in production with a total of almost 3,000,000 tons annually.

Lower Kittanning coal. Throughout the townships east of, and on Chestnut Ridge a fair quantity of information as to thickness and persistency of this coal is available. For the townships west of Chestnut Ridge, data are meager, only the records of a few widely distributed drill holes, and measurements in short outcrop areas are available.

A general average based on thicknesses in surrounding areas was adopted and a low percentage of recovery assumed, because the extent and thickness of this bed are not known.

The Lower Freeport ranks third in size of resource within the county and is third in production, with a total of 2,500,000 tons annually.

Pittsburgh coal. The extensive mining and many exposures of the outcrop of this bed furnish abundant measurements of its thickness, thus making possible an accurate and reliable computation of quantity. Due to lack of information regarding beds other than those herein described, this bed is considered as fourth in size of resource within the county, and as fourth in production, yielding almost 1,500,000 tons annually.

For some localities, no information is available as to the mined out areas of the various beds. For these places, an estimate of probable depletion has been made, based on age and size of the operations, or on the difference between original areas and statements of acreages remaining unmined.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the order following: Pittsburgh, Upper Freeport, Lower Freeport, and Lower Kittanning. The figures for the Pittsburgh bed are conservative and probably reliable, but the figures for the Lower Kittanning coal may be much too small or many times too large.

Coal resources in Indiana County

Bed	Original deposit	Mined out and lost	Recoverable
Pittsburgh	88,400,000	60,600,000	21,200,000
Upper Freeport	2,364,200,000	121,200,000	1,652,800,000
Lower Freeport	2,088,100,000	73,900,000	1,374,800,000
Lower Kittanning	1,798,700,000	43,500,000	1,239,900,000
Total	6,339,400,000	299,200,000	4,288,700,000

Summary of recoverable coal in Indiana County

Township	Upper Freeport	Lower Freeport	Lower Kittanning	Pittsburgh
Armstrong	106,700,000	120,500,000	76,500,000	
Banks	14,500,000	30,500,000	66,300,000	
Blacklick	85,600,000	38,300,000	55,200,000	400,000
Brush Valley	79,400,000	52,600,000	116,700,000	
Buffington	3,900,000	48,200,000	70,300,000	
Burrell	43,900,000	14,400,000	66,700,000	400,000
Canoe	35,900,000	12,500,000	18,200,000	
Center	110,300,000	65,000,000	66,300,000	
Cherryhill	75,800,000	91,000,000	103,800,000	
Conemaugh	102,100,000	51,500,000	2,600,000	1,900,000
E. Mahoning	69,300,000	45,200,000		
E. Wheatfield	11,600,000	31,400,000	72,700,000	
Grant	21,500,000	27,400,000	34,700,000	
Green	89,800,000	125,200,000	141,500,000	
Montgomery	53,400,000	67,500,000	67,000,000	
N. Mahoning	62,800,000	28,500,000		
Pine	5,200,000	69,100,000	50,000,000	
Rayne	135,700,000	98,000,000	37,000,000	
S. Mahoning	75,000,000	48,700,000		
Washington	102,500,000	66,500,000	30,200,000	
W. Mahoning	61,500,000	47,000,000		
W. Wheatfield	41,700,000	28,500,000	70,100,000	
White	166,200,000	77,300,000	66,000,000	
Young	98,500,000	90,000,000	28,000,000	18,500,000
Total	1,652,800,000	1,374,800,000	1,239,900,000	21,200,000

Coal resources in Indiana County by townships

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Armstrong Township							Area 38.6 square miles
U. Freeport	36.8	140,700,000	1,200,000	106,700,000	90	15	27-60
L. Freeport	36.8	157,600,000		120,500,000	90	15	20-58
L. Kittanning	38.6	112,500,000		76,500,000	80	15	28-32
Pittsburgh	.1	700,000	700,000				60-82
Total		411,500,000	1,900,000	303,700,000			
Banks Township							Area 33.6 square miles
U. Freeport	6.1	24,100,000	5,100,000	14,500,000	90	15	36-50
L. Freeport	12.1	52,500,000	12,600,000	30,500,000	90	15	24-156
L. Kittanning	28.0	90,000,000	3,200,000	66,300,000	90	15	36-50
Total		166,600,000	20,900,000	111,300,000			
Blacklick Township							Area 30.1 square miles
U. Freeport	29.0	115,900,000	3,900,000	85,600,000	90	15	41-50
L. Freeport	19.2	56,400,000		38,300,000	80	15	30-48
L. Kittanning	25.0	81,700,000	400,000	55,200,000	80	15	24-42
Pittsburgh	.3	1,800,000	1,400,000	400,000	90	15	60-72
Total		255,800,000	5,700,000	179,500,000			
Brush Valley Township							Area 43.0 square miles
U. Freeport	28.0	104,600,000	700,000	79,400,000	90	15	24-54
L. Freeport	29.0	88,500,000		52,600,000	70	15	34-38
L. Kittanning	40.2	155,700,000	3,000,000	116,700,000	90	15	30-46
Total		348,800,000	3,700,000	248,700,000			
Buffington Township							Area 30.4 square miles
U. Freeport	2.0	5,200,000		3,900,000	90	15	24-40
L. Freeport	25.8	81,200,000		48,200,000	70	15	28-40
L. Kittanning	28.4	103,400,000	11,300,000	70,300,000	90	15	30-48
Total		189,800,000	11,300,000	122,400,000			
Burrell Township							Area 26.2 square miles
U. Freeport	14.8	58,300,000	800,000	43,900,000	90	15	36-48
L. Freeport	9.0	24,300,000		14,400,000	70	15	30
L. Kittanning	24.0	87,700,000	400,000	66,700,000	90	15	36-42
Pittsburgh	1.3	1,800,000	1,200,000	400,000	90	15	60-70
Total		172,100,000	2,400,000	125,400,000			

Coal resources in Indiana County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Canoe Township							Area 29.6 square miles
U. Freeport	15.5	66,900,000	19,800,000	35,900,000	90	15	41-66
L. Freeport	5.6	19,200,000	700,000	12,500,000	80	15	6-42
L. Kittanning	10.8	30,800,000		18,200,000	70	15	10-42
Total		116,900,000	20,500,000	66,600,000			
Center Township							Area 42.3 square miles
U. Freeport	33.6	162,400,000	18,100,000	110,300,000	90	15	42-62
L. Freeport	35.9	109,600,000		65,000,000	70	15	30-48
L. Kittanning	36.1	103,100,000	5,600,000	66,300,000	80	15	28-4[illegible]
Total		375,100,000	23,700,000	241,600,000			
Cherryhill Township							Area 50.8 square miles
U. Freeport	26.9	99,200,000	100,000	75,800,000	80	15	24-60
L. Freeport	41.1	143,100,000	24,100,000	91,000,000	90	15	6-43
L. Kittanning	42.3	156,000,000	3,200,000	103,800,000	80	15	30-7[illegible]
Total		398,300,000	27,400,000	270,600,000			
Conemaugh Township							Area 35.4 square miles
U. Freeport	34.1	138,200,000	4,600,000	102,100,000	90	15	24-48
L. Freeport	32.0	86,600,000		51,500,000	70	15	30-40
L. Kittanning	1.8	4,500,000		2,600,000	70	15	[illegible]4-32
Pittsburgh	3.4	23,900,000	21,300,000	1,900,000	90	15	76-90
Total		253,200,000	25,900,000	158,100,000			
East Mahoning Township							Area 32.4 square miles
U. Freeport	26.2	102,500,000	400,000	69,300,000	80	15	26-48
L. Freeport	21.8	66,900,000	300,000	45,200,000	80	15	34-44
Total		169,400,000	700,000	114,500,000			
East Wheatfield Township							Area 31.5 square miles
U. Freeport	5.7	17,200,000		11,600,000	80	15	24-44
L. Freeport	20.1	52,900,000		31,400,000	70	15	24-32
L. Kittanning	27.5	107,400,000	12,300,000	72,700,000	90	15	40-48
Total		177,560,000	12,300,000	115,700,000			
Grant Township							Area 25.4 square miles
U. Freeport	8.0	31,400,000	3,200,000	21,500,000	90	15	24-54
L. Freeport	10.8	40,700,000	300,000	27,400,000	80	15	24-44
L. Kittanning	17.5	51,500,000	300,000	34,700,000	80	15	18-36
Total		123,600,000	3,800,000	83,600,000			

Coal resources in Indiana County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
Green Township							Area 56.0 square miles
U. Freeport	34.0	118,200,000	700,000	89,800,000	90	15	24–42
L. Freeport	46.6	171,300,000	7,500,000	125,200,000	90	15	0–48
L. Kittanning	54.6	186,200,000	1,200,000	141,500,000	90	15	32–40
Total		475,700,000	9,400,000	256,500,000			
Montgomery Township							Area 29.4 square miles
U. Freeport	24.6	93,300,000	23,400,000	53,400,000	90	15	30–50
L. Freeport	25.9	91,400,000	3,100,000	67,500,000	90	15	36–40
L. Kittanning	29.4	99,200,000		67,000,000	80	15	36–40
Total		283,900,000	26,500,000	187,900,000			
North Mahoning Township							Area 28.2 square miles
U. Freeport	27.0	105,700,000		62,800,000	70	15	42–48
L. Freeport	16.0	48,000,000		28,500,000	70	15	0–34
Total		153,700,000		91,300,000			
Pine Township							Area 29.6 square miles
U. Freeport	4.0	8,600,000		5,200,000	70	15	24–40
L. Freeport	28.6	102,600,000	12,200,000	69,100,000	90	15	0–46
L. Kittanning	20.4	65,400,000		50,000,000	90	15	30–42
Total		176,600,000	12,200,000	124,300,000			
Rayne Township							Area 49.0 square miles
U. Freeport	45.1	186,200,000	8,800,000	135,700,000	90	15	40–60
L. Freeport	42.2	133,800,000	5,700,000	98,000,000	90	15	32–48
L. Kittanning	21.1	62,500,000		37,000,000	70	15	24–42
Total		382,500,000	14,500,000	270,700,000			
South Mahoning Township							Area 29.6 square miles
U. Freeport	27.4	110,800,000	500,000	75,000,000	80	15	42–60
L. Freeport	27.0	82,000,000		48,700,000	70	15	34
Total		192,800,000	500,000	123,700,000			
Washington Township							Area 34.4 square miles
U. Freeport	33.4	135,900,000	1,900,000	102,500,000	90	15	33–60
L. Freeport	30.9	97,900,000		66,500,000	80	15	30–52
L. Kittanning	20.0	51,000,000		30,260,000	70	15	24–32
Total		284,800,000	1,900,000	199,300,000			

Coal resources in Indiana County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Thickness (Inches)
West Mahoning Township							Area 30.0 square miles
U. Freeport	25.2	103,400,000		61,500,000	70	15	42-50
L. Freeport	26.0	79,000,000		47,000,000	70	15	34
Total		182,400,000		108,500,000			
West Wheatfield Township							Area 30.9 square miles
U. Freeport	14.8	62,300,000	900,000	41,700,000	80	15	30-54
L. Freeport	17.0	48,000,000		28,500,000	70	15	32
L. Kittanning	28.0	105,800,000	2,600,000	70,100,000	90	15	42
Total		216,100,000	3,500,000	140,300,000			
White Township							Area 45.1 square miles
U. Freeport	41.4	242,000,000	24,700,000	166,200,000	90	15	54-68
L. Freeport	43.0	130,000,000		77,300,000	70	15	34
L. Kittanning	37.3	97,300,000		66,000,000	80	15	24-44
Total		469,300,000	24,700,000	309,500,000			
Young Township							Area 35.7 square miles
U. Freeport	32.1	131,200,000	2,400,000	98,500,000	90	15	36-48
L. Freeport	32.6	124,600,000	7,400,000	90,000,000	90	15	24-62
L. Kittanning	19.0	47,000,000		28,000,000	70	15	28
Pittsburgh	8.2	60,200,000	36,000,000	18,500,000	90	15	62-102
Total		363,000,000	45,800,000	235,000,000			

JEFFERSON COUNTY

BY
JAMES D. SISLER

INTRODUCTION

Jefferson County lies in the western part of Pennsylvania, and is bounded on the north by Forest and Elk counties, on the east by Clearfield County, on the south by Indiana County, and on the west by Armstrong and Clarion counties.

This county has long been the center of mining in the northern part of the main bituminous coal field. The Reynoldsville basin has produced coal for many years, and the Freeport coals in the vicinity of Punxsutawney have been exploited with much success for at least twenty years.

The principal mining areas are along the main lines of the Pittsburgh and Shawmut; Buffalo, Rochester and Pittsburgh; New York Central; and Erie railroads. Most of the coal already mined out came from the Freeport beds. The Kittanning coals are under cover in practically all the southern part of the county and shafting is necessary to reach them. The future production from Jefferson County will be from these beds which are now practically undeveloped.

COAL BEDS

There are eleven coal beds in Jefferson County, some of which are only a few inches thick; two are of great importance, and five others are locally mineable. The Lower Freeport is the most important and the Lower Kittanning is second. The Brookville, Clarion, Middle and Upper Kittanning, and Upper Freeport are locally mineable.

Mercer coal. This bed, which is geologically the lowest coal in the county, may have some future value. It is not being mined at the present time.

Brookville coal. This bed lying at the base of the Allegheny group, is most important in the vicinity of Brookville, its type locality. In the vicinity of Summerville it ranges from 2 feet 8 inches to 5 feet 6 inches. At other localities in this area it ranges from 2 to 6 feet thick but is never entirely clean. The lower part of the bed

is usually very high in sulphur. The Brookville is also thick in the eastern part of the county but has not been extensively mined. In the vicinity of Reynoldsville it is locally 3 feet thick, and at Falls Creek it has a maximum thickness of 4 feet including 1 to 2 inches of shale near the middle. The Brookville coal is deep under cover in most of the southern part of the county and drill hole records show that it is rarely too thin to be mined although locally it contains several bone and shale partings.

Lower Kittanning coal. This bed is important in most localities in Jefferson County. In the eastern part of the county it averages less than 3 feet thick. In the vicinity of Pine Creek in the southwestern part of the county it locally averages 3 feet thick and is extensively mined.

Middle Kittanning coal. This bed is mined and used exclusively for domestic fuel. Its thickness and quality are extremely variable. It is thickest and best in Union Township, where it averages 2 feet 6 inches thick, with a maximum thickness of 3 feet 6 inches. The Middle Kittanning is locally 2 to 4 feet thick in Warsaw and Washington townships. The coal is clean, without partings, and has excellent quality.

Upper Kittanning coal. This bed is generally thin and unimportant in Jefferson County. Locally it is thick enough to be mined profitably. On Pine Creek the coal has a maximum thickness of 2 feet 9 inches. In Union Township, near Corsica, it ranges from 2 feet 6 inches to 3 feet thick, and is mined for local fuel. The bed is thin and unimportant in the northeastern part of the county, and is deep under cover in the eastern and southeastern townships where little is known of its value and quality.

Lower Freeport coal. This bed is the most important in the county. More coal has been mined from this bed than all the rest of the beds combined. This production came from twelve townships, Winslow and Henderson being the principal producers. It was the first bed mined in Jefferson County and is now approaching exhaustion in the Reynoldsville basin. The Lower Freeport is of mineable thickness in every township in Jefferson County where it has not been eroded. Its greatest thickness is in Henderson Township between Big Run and Desire. Here the bed is locally over 13 feet thick including 2 feet of shale near the top of the bed. The usual thickness of the bed is approximately 4 feet, and it has no partings or binders in most localities. An exception to this rule is in McCalmont Township where a bony parting, averaging 2 inches thick, is present practically everywhere 2 feet above the bottom.

Upper Freeport Coal. This bed is very irregular in thickness and variable in quality. It is locally a fine bed of good coal. It is mined at several places on Pine Creek and in the southeastern town-

ships of the county, where it ranges from 2 feet 8 inches to 4 feet 6 inches thick. In Henderson, McCalmont, Oliver, and Ringgold townships the Upper Freeport coal ranges from 12 inches to 5 feet thick, averaging less than 2 feet. The Upper Freeport coal is now being mined extensively in Washington and Snyder townships in the Coal Glen, Brockwayville, and Crenshaw districts. The Lower Freeport has been practically worked out in these districts and the Upper Freeport has taken its place as a producer. It averages about 2 feet 6 inches thick, is fairly clean, but is high in sulphur.

COAL RESOURCES

The following tables give the estimated quantity of coal in the original deposit, quantity of coal mined out and lost, and quantity recoverable in each township. The tables also give the workable area of each coal bed in each township. Another table summarizes the coal resources by beds in Jefferson County.

The data on some of the beds in certain townships are very meager, and the writer was necessarily forced to generalize the figures somewhat. As more data are collected the estimates may be changed. However, the total quantity of coal recoverable in each township is very reliable.

Winslow Township has the largest quantity of recoverable coal, Snyder is second, and Bell is third.

The largest quantity of recoverable coal is in the Brookville bed, the Lower Kittanning is second, and the Lower Freeport is third. The largest workable area of coal is in the Lower Kittanning, Brookville is second, and the Lower Freeport is third.

Coal resources in Jefferson County

Bed	Original deposit	Mined out and lost	Recoverable
U. Freeport	356,800,000	52,500,000	217,600,000
L. Freeport	601,900,000	185,100,000	321,400,000
U. Kittanning	273,500,000		172,600,000
M. Kittanning	404,400,000	2,800,000	268,000,000
L. Kittanning	696,000,000	15,300,000	443.100,000
Brookville	1,002,300,000	23,700,000	700,700,000
Total	3,334,900,000	279,400,000	2,123,400,000

Summary of recoverable coal in Jefferson County

Township	Brookville	L. Kittanning	M. Kittanning	U. Kittanning	L. Freeport	U. Freeport
Beaver	40,000,000	3,700,000				
Bell	8,400,000	34,600,000	14,600,000	15,300,000	29,300,000	25,100,000
Clover	30,800,000	3,700,000	2,000,000			
Eldred	50,100,000					
Gaskill	8,600,000	30,400,000	9,300,000	4,600,000	9,700,000	10,600,000
Henderson		22,700,000			4,700,000	30,500,000
Knox	44,000,000	16,600,000	16,100,000		21,900,000	13,600,000
McCalmont		33,200,000	31,300,000	27,200,000	53,200,000	14,800,000
Oliver	40,200,000	29,200,000	14,800,000		9,400,000	
Perry		28,300,000		20,900,000	26,200,000	25,900,000
Pine Creek	44,700,000	7,500,000	4,900,000			
Polk	37,500,000					
Porter	29,900,000	14,200,000	15,100,000	6,300,000	34,700,000	9,500,000
Ringgold		27,000,000	19,700,000	15,100,000	19,500,000	7,400,000
Rose	23,700,000	4,200,000	2,000,000			
Snyder	47,200,000	23,200,000	29,500,000	16,700,000	9,500,000	9,500,000
Union	17,500,000	16,000,000	11,000,000	6,000,000		
Warsaw	61,000,000	27,800,000	12,000,000			
Washington	90,900,000	42,400,000	52,300,000	18,100,000	25,300,000	10,200,000
Winslow	126,200,000	57,500,000	33,400,000	42,400,000	43,800,000	40,000,000
Young		20,900,000			34,200,000	20,500,000
Total	700,700,000	443,100,000	268,000,000	172,600,000	321,400,000	217,600,000

Coal resources in Jefferson County by townships

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
Beaver Township						Area 21.76 square miles
Brookville	14	65,200,000	8,000,000	40,000,000	70	48
L. Kittanning	2	5,800,000	500,000	3,700,000	70	30
Total	16	71,000,000	8,500,000	43,700,000		
Bell Township						Area 19.4 square miles
Brookville	8.0	14,000,000		8,400,000	60	18
L. Kittanning	18.8	52,900,000		34,600,000	65	29
M. Kittanning	12.5	24,300,000		14,600,000	60	20
U. Kittanning	12.5	25,500,000		15,300,000	60	21
L. Freeport	12.5	40,000,000	1,000,000	29,300,000	75	33
U. Freeport	12.5	36,400,000	500,000	25,100,000	70	30
Total	76.8	193,100,000	1,500,000	127,300,000		
Clover Township						Area 17.00 square miles
Brookville	10	46,600,000	5,000,000	30,800,000	75	48
L. Kittanning	2	5,800,000	500,000	3,700,000	70	30
M. Kittanning	1	2,900,000		2,000,000	70	30
Total	13	55,300,000	5,500,000	36,500,000		
Eldred Township						Area 46.4 square miles
Brookville	25	77,600,000	500,000	50,100,000	65	32
Gaskill Township						Area 21.5 square miles
Brookville	7.8	14,400,000		8,600,000	60	19
L. Kittanning	18.7	43,400,000		30,400,000	70	24
M. Kittanning	8	15,500,000		9,300,000	60	20
U. Kittanning	4.5	7,700,000		4,600,000	60	18
L. Freeport	8	19,400,000	8,000,000	9,700,000	85	25
U. Freeport	8	23,300,000	10,000,000	10,600,000	80	31
Total	55	123,700,000	18,000,000	73,200,000		
Henderson Township						Area 20.48 square miles
L. Kittanning	20	34,900,000		22,700,000	65	18
L. Freeport	19	9,200,000	5,000,000	4,700,000	85	19
U. Freeport	15	49,500,000	6,000,000	30,500,000	70	34
Total	54	93,600,000	11,000,000	57,900,000		

Coal resources in Jefferson County by townships—Continued

Knox Township — Area 31 square miles

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
Brookville	20	69,800,000	2,000,000	44,000,000	65	36
L. Kittanning	16	27,900,000	300,000	16,600,000	60	18
M. Kittanning	12	27,900,000	1,000,000	16,100,000	60	24
L. Freeport	6	31,400,000	100,000	21,900,000	70	54
U. Freeport	3	17,500,000	500,000	13,600,000	80	60
Total	57	174,500,000	3,900,000	112,200,000		

McCalmont Township — Area 25.8 square miles

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
L. Kittanning	22	51,000,000		33,200,000	65	24
M. Kittanning	20	46,600,000		31,300,000	65	24
U. Kittanning	18	41,900,000		27,200,000	65	24
L. Freeport	14	81,500,000	15,000,000	53,200,000	80	60
U. Freeport	10	29,100,000	8,000,000	14,800,000	70	30
Total	84	250,100,000	23,000,000	159,700,000		

Oliver Township — Area 29.68 square miles

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
Brookville	27	62,900,000	1,000,000	40,200,000	65	24
L. Kittanning	18	41,900,000	200,000	29,200,000	70	24
M. Kittanning	10	23,300,000	500,000	14,800,000	65	24
L. Freeport	2	11,600,000	500,000	9,400,000	85	60
Total	57	139,700,000	2,200,000	93,600,000		

Perry Township — Area 28.88 square miles

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
L. Kittanning	25	43,600,000		28,300,000	65	18
U. Kittanning	20	34,900,000		20,900,000	60	18
L. Freeport	15	52,400,000	15,000,000	26,200,000	70	36
U. Freeport	11	45,000,000	8,000,000	25,900,000	70	42
Total	71	175,900,000	23,000,000	101,300,000		

Pine Creek Township — Area 29.2 square miles

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
Brookville	12	69,800,000	1,000,000	44,700,000	65	36
L. Kittanning	5	11,600,000		7,500,000	65	24
M. Kittanning	2	7,000,000		4,900,000	70	36
Total	19	88,400,000	1,000,000	57,100,000		

Polk Township — Area 35.2 square miles

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
Brookville	20	58,200,000	500,000	37,500,000	65	30

Coal resources in Jefferson County by townships—Continued

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
Porter Township						Area 19.68 square miles
Brookville	15	43,700,000	1,000,000	29,900,000	70	30
L. Kittanning	12	27,900,000	6,000,000	14,200,000	65	24
M. Kittanning	10	23,300,000	------------	15,100,000	65	24
U. Kittanning	6	10,500,000	------------	6,300,000	60	18
L. Freeport	8	46,600,000	300,000	34,700,000	75	60
U. Freeport	6	17,500,000	4,000,000	9,500,000	70	30
Total	57	169,500,000	11,300,000	109,700,000	----------	----------
Ringgold Township						Area 20.36 square miles
L. Kittanning	16	46,600,000	5,000,000	27,000.000	65	30
M. Kittanning	13	30,300,000	------------	19,700,000	65	24
U. Kittanning	10	23,300,000	------------	15,100,000	65	24
L. Freeport	8	28,000,000	200,000	19,500,000	70	36
U. Freeport	6	17,500,000	7,000,000	7,400,000	70	30
Total	53	145,700,000	12,200,000	88,700,000	----------	----------
Rose Township including Brookville Borough						Area 21.24 square miles
Brookville	12	34,900,000	1,000,000	23,700,000	70	30
L. Kittanning	3	7,000,000	500,000	4,200,000	65	24
M. Kittanning	1	3,500,000	700,000	2,000,000	70	36
Total	16	45,400,000	2,200,000	29,900,000	----------	----------
Snyder Township						Area 38.44 square miles
Brookville	20	69,800,000	1,000,000	47,200,000	70	36
L. Kittanning	16	37,200,000	1,500,000	23,200,000	65	24
M. Kittanning	14	42,100,000	------------	29,500,000	70	24
U. Kittanning	12	27,900,000	------------	16,700,000	60	24
L. Freeport	8	32,600,000	20,000,000	9,500,000	75	42
U. Freeport	6	17,500,000	4,000,000	9,500,000	70	30
Total	76	227,100,000	26,500,000	135,600,000	----------	----------
Union Township						Area 18.4 square miles
Brookville	12	27,900,000	1,000,000	17,500,000	65	24
L. Kittanning	8	23,300,000	500,000	16,000,000	70	30
M. Kittanning	5	14,500,000	------------	11,000,000	70	30
U. Kittanning	3	8,700,000	------------	6,000,000	70	30
Total	28	74,400,000	1,500,000	50,500,000	----------	----------
Warsaw Township						Area 55 square miles
Brookville	25	87,300,000	200,000	61,000,000	70	36
L. Kittanning	20	46,600,000	300,000	27,800,000	60	24
M. Kittanning	5	17,500,000	300,000	12,000,000	70	36
Total	50	151,400,000	800,000	100,800,000	----------	----------

Coal resources in Jefferson County by townships—Continued

Bed	Workable Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Per cent Recoverable	Thickness (inches)
Washington Township					Area 48.88 square miles	
Brookville	35	122,200,000	1,000,000	90,900,000	75	36
L. Kittanning	28	65,200,000	----------	42,400,000	65	24
M. Kittanning	24	69,800,000	----------	52,300,000	75	30
U. Kittanning	16	27,900,000	----------	18,100,000	65	18
L. Freeport	10	46,600,000	15,000,000	25,300,000	80	48
U. Freeport	5	17,500,000	3,000,000	10,200,000	70	36
Total	118	349,200,000	19,000,000	239,200,000	----------	----------
Winslow Township					Area 47.92 square miles	
Brookville	36	138,000,000	500,000	126,200,000	70	30
L. Kittanning	38	88,500,000	----------	57,500,000	65	24
M. Kittanning	32	55,900,000	300,000	33,400,000	60	18
U. Kittanning	28	65,200,000	----------	42,400,000	65	24
L. Freeport	24	139,700,000	85,000,000	43,800,000	80	60
U. Freeport	20	58,200,000	1,000,000	40,000,000	70	30
Total	178	545,500,000	86,800,000	343,300,000	----------	----------
Young Township					Area 17.56 square miles	
L. Kittanning	15	34,900,000	----------	20,900,000	60	24
L. Freeport	12	62,900,000	20,000,000	34,200,000	80	54
U. Freeport	8	27,800,000	500,000	20,500,000	75	36
Total	35	125,600,000	20,500,000	75,600,000	----------	----------

LAWRENCE COUNTY

By
JAMES D. SISLER

INTRODUCTION

Lawrence County lies in the western part of Pennsylvania on the western edge of the main bituminous coal field. In this region all coal beds, except those in the Allegheny group and Pottsville series, have been eroded. In general the coal beds of this county are thin. Their development has been slow because of the proximity of thicker coal beds which can be mined and shipped into the county. Practically all of the coal which has been mined in Lawrence County has been used for local domestic fuel. Some half dozen commercial mines have been working in this county for several years.

COAL BEDS

The coal beds of the Pottsville series, namely, the Quakertown, Lower and Upper Mercer coals, are of very little commercial importance in the county. The Mercer coal has the largest resource and none of it has been mined.

Brookville coal. This bed is at the base of the Allegheny group, is entirely absent in some localities, but has been mined in the northern part of the county where it is locally 3 feet 6 inches to 4 feet thick, with a bone or pyrite parting a few inches from the top.

Clarion coal. This bed is rarely of mineable thickness in the county. It is locally 18 inches thick, but averages about 6 inches. It has not been included in the calculation of the coal resources.

Kittanning coals. The correlation of the Kittanning group of coals in Lawrence County is uncertain. Two of these coals, the Lower and Upper Kittanning, are thin and unimportant. A third, locally known as the Darlington, and tentatively correlated as the Middle Kittanning, is the most important bed in the county. It is mined commercially at approximately three localities in the county. The coal is used locally for burning lime, and under the boilers of cement manufacturing plants. The Darlington has its greatest commercial value in Big Beaver Township where it is persistently 2 feet 4 inches to 2 feet 10 inches thick. It is mined locally in numerous other townships.

The occurrence of the Lower and Upper Freeport coals is restricted to a few hilltops in Lawrence County. Their value consists chiefly of supplies of local fuel. In some localities these beds have been entirely exhausted.

COAL RESOURCES

More data must be available before a very accurate estimate of coal resources of Lawrence County can be made. The following estimates are conservative, but they may be erroneous in some localities. Until more definite information is available this estimate will suffice.

Coal resources in Lawrence County

Bed	Original deposit	Mined out and lost	Recoverable
Upper Freeport	15,610,000	1,250,000	7,179,000
Lower Freeport	19,089,000	1,400,000	8,395,000
Middle Kittanning	241,902,000	3,725,000	119,531,000
Lower Kittanning	304,627,000	3,670,000	149,975,000
Brookville	314,885,000	6,400,000	154,242,000
Mercer	111,753,000	----	44,698,000
Total	1,007,866,000	16,445,000	484,020,000

Summary of recoverable coal in Lawrence County

Township	Mercer	Brookville	Lower Kittanning	Middle Kittanning	Lower Freeport	Upper Freeport
Big Beaver	1,872,000	7,735,000	8,733,000	8,983,000	3,992,000	2,819,000
Hickory	2,008,000	8,878,000	5,714,000	3,2[illegible]3,000	----	----
Little Beaver	3,402,000	12,582,000	25,365,000	16,625,000	355,000	572,000
Mahoning	2,304,000	6,552,000	2,969,000	2,218,000	----	----
Neshannock	5,745,000	5,300,000	2,024,000	864,000	----	----
North Beaver	1,080,000	21,635,000	20,834,000	20,225,000	32,000	83,000
Perry	3,096,000	12,025,000	12,464,000	11,696,000	3,931,000	3,611,000
Plain Grove	3,024,000	11,216,000	13,324,000	13,066,666	----	----
Pulaski	3,096,000	1,215,000	----	----	----	----
Scott	2,232,000	11,216,000	10,250,000	5,782,000	----	----
Shenango	1,511,000	14,466,000	12,802,000	6,929,000	----	----
Slippery Rock	3,744,000	17,570,000	21,020,000	17,788,000	----	----
Taylor	864,000	3,575,000	485,000	311,000	----	----
Union	1,656,000	4,034,000	1,089,000	787,000	----	----
Wayne	2,232,000	6,655,000	3,611,000	2,112,000	85,000	94,000
Washington	1,360,000	9,200,000	8,981,000	8,748,000	----	----
Wilmington	5,472,000	378,000	310,000	99,000	----	----
Total	44,698,000	154,242,000	149,975,000	119,531,000	8,395,000	7,179,000

Coal resources in Lawrence County by townships

Big Beaver Township — Area 14.88 square miles

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Mercer	2.6	4,680,000	-------------	1,872,000	40	20
Brookville	6.1	16,470,000	1,000,000	7,735,000	50	30
L. Kittanning	9.2	18,216,000	750,000	8,733,000	50	23
U. Kittanning	8.6	18,576,000	600,000	8,988,000	50	24
L. Freeport	3.2	9,684,000	800,000	3,992,000	50	1[illegible]
U. Freeport	3.1	6,138,000	500,000	2,819,000	50	22
Total	----------	73,764,000	3,650,000	31,139,000	----------	----------

Hickory Township — Area 16.82 square miles

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Mercer	3.1	5,022,000	-------------	2,008,000	40	18
Brookville	6.2	17,856,000	100,000	8,878,000	50	32
L. Kittanning	6.1	11,529,000	100,000	5,714,000	50	21
M. Kittanning	2.9	6,786,000	200,000	3,293,000	50	26
Total	----------	41,193,000	400,000	19,893,000	----------	----------

Little Beaver Township — Area 19.92 square miles

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Mercer	4.5	8,505,000	-------------	3,402,000	40	21
Brookville	9.5	25,665,000	500,000	12,582,000	50	30
L. Kittanning	18.9	51,030,000	300,000	25,365,000	50	30
M. Kittanning	17.1	33,858,000	600,000	16,625,000	50	22
L. Freeport	.5	810,000	100,000	355,000	50	18
U. Freeport	.5	1,345,000	200,000	572,000	50	21
Total	----------	121,213,000	1,700,000	58,901,000	----------	----------

Mahoning Township — Area 24.84 square miles

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Mercer	3.2	5,760,000	-------------	2,304,000	40	20
Brookville	5.2	13,104,000	-------------	6,552,000	50	28
L. Kittanning	3.4	6,138,000	200,000	2,969,000	50	22
M. Kittanning	2.1	4,536,000	100,000	2,218,000	50	24
Total	----------	29,538,000	300,000	14,043,000	----------	----------

Neshannock Township — Area 17.28 square miles

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Mercer	5.7	14,364,000	-------------	5,745,000	40	28
Brookville	4.0	10,800,000	200,000	5,300,000	50	30
L. Kittanning	2.1	4,149,000	100,000	2,024,000	50	22
M. Kittanning	.8	1,728,000	-------------	864,000	50	24
Total	----------	31,041,000	300,000	13,933,000	----------	----------

North Beaver Township — Area 44.40 square miles

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Mercer	1.5	2,700,000	-------------	1,080,000	40	20
Brookville	16.1	43,470,000	200,000	21,635,000	50	30
L. Kittanning	22.1	41,769,000	100,000	20,834,000	50	21
M. Kittanning	18.2	40,950,000	400,000	20,225,000	50	25
L. Freeport	.1	162,000	100,000	32,000	50	18
U. Freeport	.1	216,000	50,000	83,000	50	24
Total	----------	129,267,000	850,000	63,859,000	----------	----------

Coal resources in Lawrence County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Perry Township				Area 20.40 square miles		
Mercer	4.3	7,740,000		3,096,000	40	20
Brookville	9.1	24,570,000	500,000	12,035,000	50	30
L. Kittanning	13.6	26,928,000	1,000,000	12,464,000	50	22
M. Kittanning	11.2	24,192,000	800,000	11,696,000	50	24
L. Freeport	5.1	8,262,000	400,000	3,931,000	50	18
U. Freeport	3.9	7,722,000	500,000	3,611,000	50	22
Total		99,414,000	3,200,000	46,833,000		
Plain Grove Township				Area 19.48 square miles		
Mercer	4.2	7,560,000		3,024,000	40	20
Brookville	9.1	22,932,000	500,000	11,216,000	50	28
L. Kittanning	14.1	26,649,000		13,324,000	50	21
M. Kittanning	12.1	26,136,000		13,066,000	50	24
Total		83,277,000	500,000	40,630,000		
Pulaski Township				Area 31.24 square miles		
Mercer	4.3	7,740,000		3,096,000	40	20
Brookville	.9	2,430,000		1,215,000	50	30
Total		10,170,000		4,311,000		
Scott Township				Area 20.16 square miles		
Mercer	3.1	5,580,000		2,232,000	40	20
Brookville	9.1	22,932,000	500,000	11,216,000	50	28
L. Kittanning	10.9	20,601,000	100,000	10,250,000	50	21
M. Kittanning	7.2	11,664,000	100,000	5,782,000	50	18
Total		60,777,000	700,000	29,480,000		
Shenango Township				Area 27.92 square miles		
Mercer	2.1	3,780,000		1,511,000	40	20
Brookville	11.2	29,232,000	300,000	14,466,000	50	29
L. Kittanning	11.9	25,704,000	100,000	12,802,000	50	24
M. Kittanning	7.1	14,058,000	200,000	6,929,000	50	22
Total		72,774,000	600,000	35,708,000		
Slippery Rock Township				Area 30.32 square miles		
Mercer	5.2	9,360,000		3,744,000	40	20
Brookville	13.2	35,640,000	500,000	17,570,000	50	30
L. Kittanning	19.2	42,240,000	200,000	21,020,000	50	22
M. Kittanning	16.1	34,776,000	200,000	17,788,000	50	24
Total		122,016,000	900,000	60,122,000		

Coal resources in Lawrence County by townships—Continued

Bed	Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recover-able	Thick-ness (inches)
Taylor Township						Area 5.40 square miles
Mercer	1.2	2,160,000	----------	864,000	40	20
Brookville	2.5	7,250,000	100,000	3,575,000	50	29
L. Kittanning	.5	990,000	20,000	485,000	50	22
M. Kittanning	.3	648,000	25,000	311,000	50	24
Total	----------	11,048,000	145,000	5,235,000	----------	----------
Union Township						Area 16.48 square miles
Mercer	2.3	4,140,000	----------	1,656,000	40	20
Brookville	3.4	8,568,000	500,000	4,034,000	50	28
L. Kittanning	1.1	2,178,000	----------	1,089,000	50	22
M. Kittanning	.7	1,575,000	----------	787,000	50	25
Total	----------	16,461,000	500,000	7,566,000	----------	----------
Wayne Township						Area 16.76 square miles
Mercer	3.1	5,580,000	----------	2,232,000	40	20
Brookville	5.3	14,310,000	1,000,000	6,655,000	50	30
L. Kittanning	3.9	7,722,000	500,000	3,611,000	50	22
M. Kittanning	2.1	4,725,000	500,000	2,112,000	50	25
L. Freeport	.1	171,000	----------	85,000	50	19
U. Freeport	.1	189,000	----------	94,000	50	21
Total	----------	32,697,000	2,000,000	14,789,000	----------	----------
Washington Township						Area 16.32 square miles
Mercer	2.1	3,402,000	----------	1,360,000	40	18
Brookville	7.0	18,900,000	500,000	9,200,000	50	30
L. Kittanning	9.7	18,163,000	200,000	8,981,000	50	21
M. Kittanning	8.1	17,496,000	----------	8,748,000	50	24
Total	----------	57,961,000	700,000	28,289,000	----------	----------
Wilmington Township						Area 21.32 square miles
Mercer	7.6	13,680,000	----------	5,472,000	40	20
Brookville	.3	756,000	----------	378,000	50	28
L. Kittanning	.3	621,000	----------	310,000	50	23
M. Kittanning	.1	198,000	----------	99,000	50	22
Total	----------	15,255,000	----------	6,259,000	----------	----------

LYCOMING COUNTY

By
James D. Sisler

INTRODUCTION

The coal-bearing rocks of Lycoming County are confined to Little Pine Creek basin in Pine and McHenry townships, and the McIntyre basin in McIntyre and McNett townships. These basins are small, canoe-shaped depressions, which are evidently parts of a syncline crossing the county in a general northeast-southwest direction.

COAL BEDS

The coal beds of Lycoming County have not been definitely correlated with those in the main bituminous coal field, but it is probable that the existing correlations are correct. The Pottsville series contains no coal beds which are merchantable at present.

Brookville coal. This bed lies a few feet above the Johnson Run sandstone and is, in most localities, thick and impure. It has been mined in a few places for local fuel.

Lower Kittanning coal. This bed in the Allegheny group is the only bed which has been worked extensively for shipping coal. The Lower Kittanning coal is the most important bed in Lycoming County. It is locally known as the Big Bed, and has been mined at many places. None of these mines are large. In the Little Pine Creek basin the Lower Kittanning averages from 3 to 7 feet thick, and is generally divided into three benches by shale partings ranging from 3 to 18 inches thick. In the McIntyre-Ralston basin the bed ranges from 2 to 3 feet thick, including 4 to 5 inches of partings near the bottom. This bed is the source of the coal from Ralston which has been mined for a great many years. The coal is a semi-bituminous steam coal of fair quality, low in sulphur but rather high in ash.

Middle Kittanning coal. This bed, lying about 20 feet above the Lower Kittanning, ranges from 1 to 7 feet thick. It contains numerous bands of material high in ash. It is not being mined commercially and has not been included in the calculation of coal resources.

Upper Kittanning coal. This bed lying approximately 50 feet above the Lower Kittanning, is thick, but is extremely impure. It also has not been mined and is not counted as a resource for future use.

Lower Freeport coal. This bed, lying from 80 to 90 feet below the Upper Freeport, ranges from 5 to 11 feet thick, but it is entirely worthless because of its numerous bone and shale partings.

Upper Freeport coal. This bed, at the top of the Allegheny group, is important in the McIntyre-Ralston basin, where it ranges from 2 to 7 feet thick. It is generally divided by one or more thick shale partings, into two or three benches, the merchantable coal averaging less than 3 feet thick. In one locality near the center of the basin the coal is 7 feet thick, and is very clean.

COAL RESOURCES

Lack of detailed information has made it impossible to separate the coal resources of Lycoming County into townships. It is also impossible to determine the exact tonnage mined out, from each bed. A fairly accurate approximation of the coal tonnage in this county is as follows:

Coal resources in Lycoming County

Original deposit	72,000,000
Mined out and lost	7,000,000
Recoverable	40,000,000

The Upper Freeport bed originally contained 8,000,000 tons, the Middle Kittanning 20,000,000 tons, and the Lower Kittanning 44,000,000 tons.

The Upper Freeport contains 5 million tons of reserve coal, the Middle Kittanning 15,000,000, and the Lower Kittanning 20,000,000 tons.

MERCER COUNTY

By
James D. Sisler

INTRODUCTION

Mercer County is the only county in Pennsylvania wherein Pottsville coals have been mined on a commercial scale. The Sharon coal was mined and practically exhausted more than 50 years ago. A considerable tonnage of this coal remains in large pillars and in areas too thin to be mined profitably in those days. Some of this coal may be recovered.

All of the coal of Mercer County is in its southeastern third. Commercial mining is small. Very little prospecting has been done in the last twenty years and information concerning the coal beds is meager. The geology of the county has not been mapped in detail, and because of the lack of definite information, no attempt was made to calculate the resources by townships.

COAL BEDS

There are seven workable beds in the county and several other thin and unimportant ones. The Brookville (Pardoe) coal is the only important bed remaining, the others having been mined out, or mutilated by inferior mining methods in the past.

Sharon coal. This bed was at one time highly valued for steam and domestic fuel, and in firing blast furnaces. The bed ranges from a few inches to 5 feet thick, and averages about four feet.

Quakertown coal. This bed is persistent in Mercer County, but nowhere is as thick or as pure as the Sharon coal. It is too thin to be mined on a commercial scale, but it has been opened for domestic use in a few localities. It has not been included in the calculation of coal resources.

Lower Mercer coal. This bed is mined almost exclusively for domestic fuel. Its maximum thickness is 4 feet. It, however, may have future value as a commercial producer, and has been computed as a resource.

Brookville coal. This bed, locally known as the Pardoe coal, is the most important bed in Mercer County. All the large mines are working this bed, and practically the entire production of the county

comes from it. The coal ranges from 3 feet 6 inches to 4 feet 6 inches thick. It is being mined in Lake Township where it averages over four feet thick.

Lower and Middle Kittanning coals. These beds are so small in area and variable in thickness that they have little value except for domestic fuel.

COAL RESOURCES

The following table gives the coal resources of Mercer County.

The Middle and Lower Kittanning and the Mercer coals are 50 per cent recoverable, the Sharon 40 per cent, and the Brookville 60 per cent.

The computation of the coal resources in the Brookville is very accurate. The computations for the other beds are less reliable, because of the lack of detailed information.

Summary of coal resources in Mercer County

Bed	Original deposit	Mined out and lost	Recoverable	Workable area (sq. mi.)
M. Kittanning	4,320,000	----------	2,160,000	2
L. Kittanning	12,960,000	----------	6,480,000	4
Brookville	180,000,000	25,000,000	93,000,000	50
Mercer	194,400,000	5,000,000	99,700,000	60
Sharon	108,000,000	50,000,000	23,200,000	30
Total	499,680,000	80,000,000	224,540,000	----------

McKEAN COUNTY

By
James D. Sisler

INTRODUCTION

McKean County lies in the extreme northern edge of the main bituminous coal field of Pennsylvania. The Allegheny group, which contains the chief coal beds in the main field, has been almost entirely eroded in this county. A few small areas of the two coal beds near the base of this group are the only remnants of Allegheny coal in McKean County.

COAL BEDS

The Pottsville series contains three mineable coal beds in this county. They are known as the Alton group of coals. The lower coal is thickest in the eastern part of the county. It has been opened at Hamlin, Splint, and Lyman Camp mines, where it averages 4 feet thick.

The middle coal is generally composed of two to four benches separated by shale partings. It has been mined at Alton in Lafayette Township, where it ranges from 4 to 8 feet thick, including partings.

The upper Alton coal ranges from 2 feet to 3 feet 6 inches thick, and is generally one bench, although locally the bed is full of thin bone partings. The coal was worked many years ago at Buttsville, and near Clermont, but the openings have now fallen shut.

The Clermont coal has been mined in Sergeant and Norwich townships, but the openings are now abandoned. The bed is very lenticular, ranging from 18 inches to 4 feet thick. The coal is hard, and brittle, high in ash and sulphur, and is nearly 40 per cent volatile matter. Its greatest importance as a producer was between 1890 and 1900, when it was mined for boiler fuel in oil and gas well drilling. It has future value as a source for domestic fuel.

The production of coal from McKean County has been very small in the last twenty years. Practically all of the coal which has been mined out was extracted in the late 80's.

COAL RESOURCES

The Alton bed has the largest reserve of recoverable coal. More coal has been mined from it than from the Clermont. The resources of coal in McKean County will not have much commercial value until

Pennsylvania's soft coal has been almost depleted. These beds, however, have a large value for local use, and much of the coal will probably be mined for this purpose.

Coal resources in McKean County

Bed	Original deposit	Mined out and lost	Recoverable
Alton	245,025,000	1,103,000	121,860,000
Clermont	177,840,000	512,000	104,443,000
Total	422,865,000	1,615,000	226,303,000

Summary of recoverable coal in McKean County

Township	Alton	Clermont
Bradford	3,868,000	1,752,000
Corydon	6,305,000	3,882,000
Hamilton	10,935,000	8,164,000
Hamlin	7,112,000	7,696,000
Keating	6,762,000	5,751,000
Lafayette	22,731,000	19,818,000
Liberty	5,003,000	5,646,000
Norwich	15,712,000	14,282,000
Sergeant	26,751,000	20,224,000
Wetmore	16,681,000	17,228,000
Total	121,860,000	104,443,000

Coal resources in McKean County by townships

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Bradford Township				Area 105.7 square miles		
Alton	3.1	7,812,000	75,000	3,868,000	50	28
Clermont	1.0	2,970,000	50,000	1,752,000	60	33
Total		10,782,000	125,000	5,620,000		
Corydon Township				Area 77.15 square miles		
Alton	5.2	12,636,000	25,000	6,305,000	50	27
Clermont	2.0	6,480,000	10,000	3,882,000	60	36
Total		19,116,000	35,000	10,187,000		
Hamilton Township				Area 74.38 square miles		
Alton	8.1	21,870,000		10,935,000	50	30
Clermont	4.2	13,608,000	1,000	8,164,000	60	36
Total		35,478,000	1,000	19,099,000		

Coal resources in McKean County by townships—Continued

Bed	Workable Area (Sq. Mi.)	Original deposit	Mined out and lost	Recoverable	Per cent recoverable	Thickness (inches)
Hamlin Township						Area 67.27 square miles
Alton	6.1	14,274,000	50,000	7,112,000	50	26
Clermont	4.2	12,852,000	25,000	7,696,000	60	34
Total		27,126,000	75,000	14,808,000		
Keating Township						Area 100.08 square miles
Alton	6.1	13,725,000	2,000	6,762,000	50	25
Clermont	3.2	9,504,000	1,000	5,751,000	60	33
Total		23,229,000	3,000	12,513,000		
Lafayette Township						Area 73.55 square miles
Alton	18.1	45,612,000	150,000	22,731,000	50	28
Clermont	11.9	36,414,000	50,000	19,818,000	60	34
Total		82,026,000	200,000	42,549,000		
Liberty Township						Area 82.50 square miles
Alton	4.2	10,206,000	200,000	5,003,000	50	27
Clermont	3.1	9,486,000	75,000	5,646,000	60	34
Total		19,692,000	275,000	10,649,000		
Norwich Township						Area 96.07 square miles
Alton	14.1	31,725,000	300,000	15,712,000	50	25
Clermont	8.3	23,904,000	100,000	14,282,000	60	32
Total		55,629,000	400,000	29,994,000		
Sergeant Township						Area 81.94 square miles
Alton	22.1	53,703,000	200,000	26,751,000	50	27
Clermont	11.4	33,858,000	150,000	20,224,000	60	33
Total		87,561,000	350,000	46,975,000		
Wetmore Township						Area 79.58 square miles
Alton	14.3	33,462,000	100,000	16,681,000	50	26
Clermont	9.4	28,764,000	50,000	17,228,000	60	34
Total		62,226,000	150,000	33,909,000		

SOMERSET COUNTY

By
John F. Reese

INTRODUCTION

Somerset County contains one of the largest resources of low volatile steam coal in the State. The first large production of coal came from the Pittsburgh bed, in the southern part of the county. In the last twenty years the Upper Kittanning has become very important in the northern part of the county.

There are fourteen coal beds of mineable thickness in the county. The Allegheny group coals are the most important, as the Pittsburgh bed has practically been mined out. All of the coals are highly valued for generating steam. They are generally soft and friable, but stand transportation better than coals of the same type from other localities.

With the exception of the area along the Baltimore & Ohio Railroad, practically all of the major developments have been in the northern part of the county. The coal in some townships is yet practically virgin, and represents an enormous source of good coal for future use.

COAL BEDS

Somerset County contains nine coal beds that are now of economic interest. In order of present importance as shipping coals they are: the Upper Kittanning, Lower Kittanning, Upper Freeport, Pittsburgh Rider, Pittsburgh, Lower Freeport, Clarion, Sewickley, and and Brookville.

In this report, the coals of the Berlin district which have been recently correlated by members of this Survey, are considered and computed according to the following table:

Coal beds in Berlin district

Sewickley (or Tyson) coal	No. 1 or Berlin coal
Pittsburgh Rider coal	Coal on Coleman farm
Pittsburgh coal	No. 2 or Price coal

It is to be understood that the correlations assumed here are subject to correction when more detailed geological work is completed.

Upper Kittanning coal. The extensive mining development and outcrop of this bed, and a fair number of core drill records have furnished many measurements of its thickness and evidence of its persistency. This makes possible a fairly accurate estimate of the quantity of coal in the bed. In the Wellersburg field, and south of Meyersdale where the data are meagre, an average thickness of 30 inches has been assumed. This bed is thickest in Jenner and Conemaugh townships, ranging from 38 to 87 inches.

The Upper Kittanning is the most persistent bed, contains the greatest coal reserve, and is the largest producer within the county, yielding more than 4,100,000 tons annually.

Lower Kittanning coal. A fair quantity of information as to the thickness and persistency of this bed throughout the northern half of the county is available. In the southern part data are meagre except where coal is mined. Little is known as to the extent and thickness of the beds over large areas, and a general average based on thickness in surrounding areas was used in computing quantity.

The Lower Kittanning is best suited to mining in Conemaugh, Paint, Shade, and Quemahoning townships, with a thickness range of 36 to 58 inches. In Brothers Valley Township it is 42 to 62 inches thick on the eastern side of the Berlin Basin. On the western side of the basin in Brothers Valley and Stony Creek townships core drill records show that this bed has a maximum thickness of 10 inches.

The Lower Kittanning bed contains the second greatest resource within the county, and ranks second in production with a total of over 3,800,000 tons annually.

Upper Freeport coal. The extensive outcrop of this bed throughout the county and the mines in various localities furnish enough measurements to make possible a fairly accurate estimate of quantity.

This coal is thickest in Jenner, Conemaugh, Lincoln, Somerset and Quemahoning townships with a thickness range of 34 to 71 inches. The percentage of this bed that can be recovered is governed by the sequence in which the Upper and Lower Freeport coals are mined. If the Lower Freeport bed is worked first and pillars are drawn, the overlying rocks will cave and break the Upper Freeport bed, thereby causing a partial and in many places complete loss of that coal.

The Upper Freeport coal is third in size of resource within the county, and ranks third in production with a total of over 840,000 tons annually.

*Pittsburgh Rider.** An accurate estimate of the quantity of coal in the Pittsburgh Rider bed is made possible by many measurements at mines and outcrop. The mines are in Summit and Elk Lick townships. A conservative percentage of recovery has been used in

*This bed is locally known as the Redstone or "four foot."

computing the recoverable tonnage, because most of the underlying Pittsburgh coal has been mined and the pillars drawn, causing the intervening rocks to cave and break this bed, making it difficult and costly to mine.

The Pittsburgh Rider bed is the eighth in size of resource within the county, and ranks fourth in production with a total of over 670,-000 tons annually.

Pittsburgh coal. The extensive development and outcrop of this bed furnish much information as to its extent and thickness. Pittsburgh coal has been mined so many years in Summit and Elk Lick townships that it is practically exhausted. In Southampton, Brothers Valley and Jenner townships this coal has been developed in recent years. Brothers Valley Township contains the largest resource.

The No. 2 or Price coal of the Berlin area in Brothers Valley Township has been correlated as the Pittsburgh coal and is computed as such in this report. From drill hole records and the outcrop, the extent of this bed has been fairly accurately defined. The area as defined is subject to correction when more information is available from future prospecting and development.

The Pittsburgh bed is seventh in size of resource in the county, and ranks fifth in production with a total of over 420,000 tons annually.

Lower Freeport coal. A fair quantity of information is available as to the extent and thickness of this coal. It is thickest in Somerset and Quemahoning townships, and because of its exceptionally fine quality in the vicinity of Friedens, it is in great demand as a smithing coal.

As this bed is extremely variable in thickness and persistency, it has been considered as a resource only in areas contiguous to mines or to drill holes that prove it to be of workable thickness. A low percentage of recovery has been assumed because the bed is so irregular.

The Lower Freeport coal as computed in this report is fourth in size of resource within the county, and ranks sixth in production, yielding over 174,000 tons annually.

Clarion coal. This coal has been computed as of economic interest in six townships, namely Addison, Black, Milford, Paint, Somerset, and Upper Turkey Foot. Little is known of its thickness and extent, and only areas surrounding development or proven ground have been computed.

Future prospecting may enlarge these areas, but information is meagre at the present time. The Clarion coal is thickest in Black Township, ranging from 40 to 58 inches. This coal is extremely variable and is broken by partings. Therefore a low recoverable percentage was used in these computations.

The Clarion coal seems to be sixth in size of resource in the county, and ranks seventh in production with a total of over 87,000 tons annually.

Sewickley coal. The No. 1 of Berlin coal in Brothers Valley township has been correlated as the Sewickley coal, and is computed as such in this report.

From drill hole records and the extent of this bed, the outcrop has been defined fairly accurately. The area as defined is subject to correction when future prospecting and development furnish more information.

The Sewickley coal is mined only in Brothers Valley Township in the vicinity of Pine Hill where it averages 44 inches thick.

The Sewickley coal is ninth in size of resource within the county, and ranks eighth in production with a total of over 81,000 tons annually.

Brookville coal. This bed has economic interest in six townships, namely Black, Brothers Valley, Elk Lick, Milford, Somerset, and Summit.

Data are meagre as to its thickness and extent, and it has been considered as existing only in areas contiguous to localities where mined. The Brookville coal is 30 to 36 inches thick in Black and Somerset townships.

The Brookville coal is fifth in size of resource within the county, and ranks ninth in production, yielding over 68,000 tons annually.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the order following: Pittsburgh, Pittsburgh Rider, Sewickley, Upper Kittanning, Lower Kittanning, Upper Freeport, Lower Freeport, Clarion, and Brookville. Thus, while the figures for the Pittsburgh bed are conservative and probably reliable, the figures for the Brookville coal may be much too small or many times too large.

Coal resources in Somerset County

Coal beds	Original deposit	Mined out and lost	Recoverable
Sewickley	8,700,000	3,600,000	3,400,000
Pittsburgh Rider	15,400,000	7,400,000	5,400,000
Pittsburgh	51,000,000	29,504,000	16,100,000
U. Freeport	866,600,000	7,380,000	525,700,000
L. Freeport	370,100,000	1,540,000	219,600,000
U. Kittanning	3,086,500,000	84,050,000	2,188,500,000
L. Kittanning	1,500,200,000	52,400,000	910,700,000
Clarion	89,800,000	750,000	54,600,000
Brookville	103,500,000	760,000	62,900,000
Total	6,091,800,000	187,384,000	3,986,900,000

Summary of recoverable coal in Somerset County

Township	Sewickley	Pittsburgh Rider	Pittsburgh	Upper Freeport	Lower Freeport	Upper Kittanning	Lower Kittanning	Clarion	Brookville
Addison	----	----	----	19,000,000	2,200,000	74,000,000	34,000,000	4,100,000	----
Black	----	----	----	4,000,000	6,600,000	15,500,000	11,700,000	29,500,000	23,000,000
Brothers Valley	3,400,000	----	10,400,000	12,400,000	20,100,000	90,500,000	62,900,000	----	6,400,000
Conemaugh	----	----	----	55,700,000	----	95,500,000	81,900,000	----	----
Elk Lick	----	4,100,000	3,200,000	25,800,000	14,600,000	27,500,000	33,100,000	----	2,700,000
Fair Hope	----	----	----	----	----	----	500,000	----	----
Jefferson	----	----	----	30,500,000	----	35,100,000	34,100,000	----	----
Jenner	----	----	900,000	86,000,000	3,600,000	1,254,600,000	109,000,000	----	----
Lincoln	----	----	----	40,300,000	9,600,000	46,000,000	33,500,000	----	----
Lower Turkey Foot	----	----	----	13,300,000	----	30,700,000	20,800,000	----	----
Middle Creek	----	----	----	16,500,000	2,400,000	27,700,000	26,100,000	----	----
Milford	----	----	----	7,400,000	10,000,000	46,200,000	36,100,000	4,800,000	7,000,000
Ogle	----	----	----	----	----	400,000	2,900,000	----	----
Paint	----	----	----	3,200,000	6,500,000	27,200,000	37,600,000	9,500,000	----
Quemahoning	----	----	----	37,100,000	29,200,000	49,500,000	54,200,000	----	----
Shade	----	----	----	19,700,000	11,400,000	69,900,000	77,060,000	----	----
Somerset	----	----	----	56,100,000	46,000,000	90,100,000	86,900,000	4,000,000	18,300,000
Southampton	----	----	600,000	8,100,000	----	12,200,000	16,500,000	----	----
Stony Creek	----	----	----	36,200,000	38,000,000	99,200,000	83,700,000	----	----
Summit	----	1,300,000	1,000,000	24,700,000	10,200,000	34,800,000	32,400,000	----	5,500,000
Upper Turkey Foot	----	----	----	29,700,000	9,800,000	61,900,000	35,800,000	2,700,000	----
Total	3,400,000	5,400,000	16,100,000	525,700,000	219,600,000	2,188,500,000	910,700,000	54,600,000	62,900,000

The foregoing summary tables were prepared from the following tables which give the details by townships. The figures in the second column represent the area of each coal bed in square miles. A blank space in the fourth column indicates that the coal bed has not been mined commercially within the township. The fifth column is the percentage of the total thickness of the bed estimated as recoverable, from which is subtracted 15 per cent for loss in mining. This gives the quantity computed as recoverable, shown in the seventh column. The range in thickness of the coal beds in inches is given in the last column.

All the coal beds in the county are accessible by drift.

Coal resources in Somerset County by townships

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
Addison Township							Orea 56.3 square miles
U. Freeport	16.4	36,100,000		60	15	19,000,000	24–30
L. Freeport	1.7	4,400,000		60	15	2,200,000	24–34
U. Kittanning	23.6	98,400,000	1,600,000	90	15	74,000,000	34–60
L. Kittanning	22.0	66,600,000		60	15	34,000,000	30–34
Clarion	3.0	8,100,000		60	15	4,100,000	30
Total,		213,600,000	1,600,000			133,300,000	
Black Township							Area 34.1 square miles
U. Freeport	2.1	6,000,000	60,000	80	15	4,000,000	24–36
L. Freeport	3.1	9,700,000		80	15	6,600,000	34–36
U. Kittanning	4.6	20,700,000	450,000	90	15	15,500,000	46–60
L. Kittanning	7.6	20,500,000	800,000	70	15	11,700,000	28–40
Clarion	12.9	44,000,000	550,000	80	15	29,500,000	30–58
Brookville	13.3	35,600,000	700,000	80	15	23,000,000	30–36
Total,		136,500,000	2,560,000			90,300,000	
Brothers Valley Township							Area 56.5 square miles
Sewickley	2.2	8,700,000	3,600,000	80	15	3,400,000	44
Pittsburgh	3.6	14,900,000	1,200,000	90	15	10,400,000	46
U. Freeport	14.7	24,400,000		60	15	12,400,000	24–30
L. Freeport	11.8	29,900,000	200,000	80	15	20,100,000	24–34
U. Kittanning	39.5	134,900,000	1,800,000	80	15	90,500,000	24–54
L. Kittanning	30.0	95,600,000	3,000,000	80	15	62,900,000	28–60
Brookville	4.6	12,700,000		60	15	6,400,000	30–34
Total		321,100,000	9,800,000			206,100,000	
Conemaugh Township							Area 37.5 square miles
U. Freeport	20.3	82,400,000	360,000	80	15	55,700,000	34–68
U. Kittanning	29.4	136,700,000	11,800,000	90	15	95,500,000	36–66
L. Kittanning,	30.7	113,700,000	6,600,000	90	15	81,900,000	36–48
Total,		332,800,000	18,760,000			233,100,000	

Coal resources in Somerset County by townships—Continued

Elk Lick Township — Area 53.6 square miles

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
Pittsburgh Rider	2.5	11,700,000	5,600,000	80	15	4,100,000	52
Pittsburgh	3.6	25,200,000	21,000,000	90	15	3,200,000	78
U. Freeport	21.0	50,700,000	30,000	60	15	25,800,000	24-30
L. Freeport	8.7	21,800,000	300,000	80	15	14,600,000	24-34
U. Kittanning	20.0	54,000,000		60	15	27,500,000	30
L. Kittanning	26.0	65,000,000		60	15	33,100,000	28
Brookville	2.0	5,400,000		60	15	2,700,000	30
Total		233,800,000	26,930,000			111,000,000	

Fair Hope Township — Area 14.2 square miles

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
L. Kittanning	.4	1,000,000		60	15	500,000	30

Jefferson Township — Area 37.5 square miles

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
U. Freeport	15.6	51,400,000		70	15	30,500,000	36-40
U. Kittanning	16.0	59,000,000		70	15	35,100,000	40-44
L. Kittanning	21.0	57,400,000		70	15	34,100,000	30-34
Total		167,800,000				99,700,000	

Jenner Township — Area 61.0 square miles

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
Pittsburgh	.4	1,400,000	4,000	80	15	900,000	40
U. Freeport	29.0	129,100,000	2,500,000	80	15	86,000,000	24-68
L. Freeport	1.7	5,500,000	60,000	80	15	3,600,000	24-36
U. Kittanning	34.4	1,682,000,000	41,900,000	90	15	1,254,600,000	36-72
L. Kittanning	40.8	142,600,000		80	15	109,000,000	28-60
Total		1,960,600,000	44,464,000			1,454,100,000	

Lincoln Township — Area 24.2 square miles

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
U. Freeport	15.8	60,400,000	1,000,000	80	15	40,300,000	40-44
L. Freeport	5.9	15,200,000		70	15	9,000,000	24-26
U. Kittanning	16.5	66,100,000	5,900,000	90	15	46,000,000	40-50
L. Kittanning	18.4	56,600,000	200,000	70	15	33,500,000	34-36
Total		198,300,000	7,100,000			128,800,000	

Lower Turkey Foot Township — Area 34.0 square miles

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
U. Freeport	9.6	26,100,000		60	15	13,300,000	24-36
U. Kittanning	14.2	45,500,000	300,000	80	15	30,700,000	34-46
L. Kittanning	15.0	40,800,000		60	15	20,800,000	30-34
Total		112,400,000	300,000			64,800,000	

Coal resources in Somerset County by townships—Continued

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
Middle Creek Township						Area 28.4 square miles	
U. Freeport	10.0	32,400,000		60	15	16,500,000	36
L. Freeport	2.0	4,800,000		60	15	2,400,000	24-30
U. Kittanning	12.6	46,600,000		70	15	27,700,000	36-60
L. Kittanning	19.0	51,300,000		60	15	26,100,000	30
Total		135,100,000				72,700,000	
Milford Township						Area 24.5 square miles	
U. Freeport	5.8	14,600,000		60	15	7,400,000	24-36
L. Freeport	6.4	17,000,000	30,000	70	15	10,000,000	24-36
U. Kittanning	19.9	77,800,000		70	15	46,200,000	40-60
L. Kittanning	22.2	60,700,000		70	15	36,100,000	30-42
Clarion	3.0	8,100,000		70	15	4,800,000	30
Brookville	4.4	12,000,000	60,000	70	15	7,000,000	30-34
Total		190,200,000	90,000			111,500,000	
Ogle Township						Area 31.6 square miles	
U. Kittanning	.2	800,000	200,000	80	15	400,000	48
L. Kittanning	1.1	4,200,000	300,000	90	15	2,900,000	42-50
Total		5,000,000	500,000			3,300,000	
Paint Township						Area 30.7 square miles	
U. Freeport	2.1	6,400,000		60	15	3,200,000	34
L. Freeport	6.0	12,900,000		60	15	6,500,000	24
U. Kittanning	11.2	43,200,000	7,600,000	90	15	27,200,000	36-48
L. Kittanning	19.8	73,800,000	24,600,000	90	15	37,600,000	28-56
Clarion	3.0	16,200,000	200,000	70	15	9,500,000	60
Total		152,500,000	32,400,000			84,000,000	
Quemahoning Township						Area 26.4 square miles	
U. Freeport	15.9	54,900,000	300,000	80	15	37,100,000	34-48
L. Freeport	18.6	57,400,000		60	15	29,200,000	24-36
U. Kittanning	20.5	69,200,000	4,400,000	90	15	49,500,000	34-46
L. Kittanning	23.1	80,600,000	800,000	80	15	54,200,000	34-54
Total		262,100,000	5,500,000			170,000,000	
Shade Township						Area 63.5 square miles	
U. Freeport	9.2	29,500,000	400,000	80	15	19,700,000	34-36
L. Freeport	8.6	22,400,000		60	15	11,400,000	24-40
U. Kittanning	25.0	91,900,000	500,000	90	15	69,900,000	36-44
L. Kittanning	27.4	116,400,000	15,800,000	90	15	77,000,000	36-80
Total		260,200,000	16,700,000			178,000,000	

Coal resources in Somerset County by townships—Continued

Coal beds	Area (sq. mi.)	Original deposit	Mined out and lost	Per cent mineable	Mining loss per cent	Recoverable	Thickness inches
Somerset Township							Area 55.9 square miles
U. Freeport	26.0	85,200,000	2,600,000	80	15	56,100,000	30–44
L. Freeport	24.6	68,300,000	800,000	80	15	46,000,000	24–48
U. Kittanning	37.5	139,100,000	6,600,000	80	15	90,100,000	30–60
L. Kittanning	48.9	146,400,000	300,000	70	15	86,900,000	28–38
Clarion	3.0	8,000,000		60	15	4,000,000	30
Brookville	9.3	27,000,000		80	15	18,300,000	30–36
Total		474,000,000	10,300,000			301,400,000	
Southampton Township							Area 26.3 square miles
Pittsburgh	.2	1,100,000	300,000	90	15	600,000	62
U. Freeport	6.0	16,000,000		60	15	8,100,000	30
U. Kittanning	9.0	24,000,000		60	15	12,200,000	30
L. Kittanning	12.0	32,400,000		60	15	16,500,000	30
Total		73,500,000	300,000			37,400,000	
Stony Creek Township							Area 59.1 square miles
U. Freeport	20.4	61,000,000	100,000	70	15	36,200,000	24–36
L. Freeport	23.2	64,100,000	100,000	70	15	38,000,000	24–40
U. Kittanning	40.2	146,000,000	100,000	80	15	99,200,000	24–54
L. Kittanning	36.8	140,700,000		70	15	83,700,000	28–80
Total		411,800,000	300,000			257,100,000	
Summit Township							Area 42.6 square miles
Pittsburgh Rider	.8	3,700,000	1,800,000	80	15	1,300,000	52
Pittsburgh	1.2	8,400,000	7,000,000	90	15	1,000,000	78
U. Freeport	16.2	41,700,000	30,000	70	15	24,700,000	24–30
L. Freeport	7.1	17,300,000	50,000	70	15	10,200,000	24–34
U. Kittanning	19.8	59,200,000	600,000	70	15	34,800,000	30–46
L. Kittanning	23.0	63,700,000		60	15	32,400,000	28–36
Brookville	4.0	10,800,000		60	15	5,500,000	36
Total		204,800,000	9,480,000			109,900,000	
Upper Turkey Foot Township							Area 34.8 square miles
U. Freeport	18.6	58,300,000		60	15	29,700,000	30–36
L. Freeport	8.0	19,400,000		60	15	9,800,000	24–30
U. Kittanning	23.3	91,400,000	300,000	80	15	61,900,000	34–60
L. Kittanning	26.0	70,200,000		60	15	35,800,000	30
Clarion	2.0	5,400,000		60	15	2,700,000	30
Total		244,700,000	300,000			139,900,000	

TIOGA COUNTY (BLOSSBURG DISTRICT)

By
James D. Sisler

INTRODUCTION

The coals of Tioga County are contained in two canoe-shaped synclinal basins. The first, and most important, the Blossburg basin, extends in a general northeast-southwest direction across Ward, Covington, Hamilton, Bloss, Duncan, Liberty, and Morris townships. The largest acreages of coal are in Ward, Hamilton, Bloss and Duncan townships; the other townships contain only a few outlying areas.

The second, or Gaines basin, extending diagonally across the county a few miles north of and approximately parallel to the Blossburg basin, has preserved a few small areas of coal in northern Gaines township, and one small area in northern Delmar township.

The Blossburg basin is the only important coal area, and the Gaines basin coal resources have been incorporated with those of the Blossburg basin. No attempt has been made to compute the resources by townships, as the field is a well defined unit in itself.

COAL BEDS

Lower Kittanning coal. The most important coal bed, the Bloss, has been correlated as the Lower Kittanning. This bed was the first one mined in the district, and has furnished about 25,000,000 tons of coal. It is now practically exhausted.

Bear Creek coal. This bed lying from 20 to 40 feet below the Bloss is very irregular in thickness and quality. It is good locally and some coal has been mined from it.

Morgan and Seymour coal beds. These beds, lying above the Bloss, give promise of value when the Bloss has been depleted. Mining of them has already been started, and not much difficulty is encountered, although the Bloss has been mined out beneath.

Bulletin M6, Part II, discusses the physical and chemical character of the coal beds.

COAL RESOURCES

The following table gives the quantity of coal in the original deposit by beds, the quantity mined out and lost, and the recoverable tonnage.

The Bear Creek, Morgan, and Seymour coals are 50 per cent recoverable, and the Bloss 70 per cent. An excellent quantity of information was available in the computation of the resources in the Bloss bed. Difficulties were encountered in the computation of the resources in the Seymour, Morgan, and Bear Creek coals, because they have been little mined.

Summary of coal resources in Tioga County

Bed	Workable area (sq. miles)	Original deposit	Mined out and lost	Recoverable
Seymour	11.4	34,956,000	1,000,000	16,978,000
Morgan	13.6	31,916,000	1,500,000	15,208,000
Bloss	15.2	54,720,000	45,000,000	6,804,000
Bear Creek	17.0	33,840,000	500,000	16,670,000
Total		155,432,000	48,000,000	55,660,000

WASHINGTON COUNTY

By
John F. Reese

INTRODUCTION

Washington County contains approximately 40 per cent of the reserve Pittsburgh coal in the State. Several beds other than the Pittsburgh are mineable, and will be more valuable when the Pittsburgh is exhausted. Some of the beds above the Pittsburgh are now being mined, but development has not reached the beds below the Pittsburgh, because they lie at great depth and little is known of their quality and thickness.

There are thirty coal beds in the county, many of which are a few inches thick, and only eight are locally workable. The Pittsburgh is the most persistent and important coal. The Waynesburg and Washington beds are greatly valued for local fuel.

COAL BEDS

Washington County has the second largest resource of coal within the State.

Five beds are considered of economic value, and the quantity of coal in the ground has been calculated for each of these beds.

In order of present importance as shipping coals, they are: the Pittsburgh, Redstone, Waynesburg, Washington, and Freeport.

Pittsburgh coal. The extensive mining and prospecting of this bed, and its outcrop throughout the county, have furnished many measurements of its thickness, thus making possible a reliable computation of quantity. For some localities, particularly the old abandoned workings along Monongahela River and large areas in the northwestern part of the county, no maps or other data are available from which to determine the size of the areas already mined out.

Redstone coal. This bed is developed locally in three townships within the county, namely Union, Carroll, and Fallowfield. Measurements on the outcrop and in mine workings furnish the only data available for computing the quantity. It has been assumed that the bed is continuous within these townships and an average thickness of 3 feet has been used in the calculations. This coal is mined on a very small scale for shipment and for local use.

Waynesburg coal. The extensive outcrop of this bed throughout the county has furnished many measurements of its thickness, thus making possible a fairly reliable computation of quantity. This bed is broken by many partings, is extremely variable in its section, and in many localities is under shallow cover. For these reasons it cannot be considered as a good resource for future commercial use, and in computing the quantity of coal only a small percentage of the bed has been figured as mineable. The coal is mined for local use only.

Washington coal. Measurements on the outcrop of this coal bed have been obtained in sufficient number to make a fairly reliable computation of the tonnage. Like the Waynesburg coal, this bed is broken by many partings, is variable in section, and in places is under shallow cover. It is extremely dirty and in many places is represented by carbonaceous shale. For these reasons only a small percentage has been considered recoverable. The Washington coal is mined for local use only and cannot be considered as a good source of future supply.

Freeport coal. Records of drill holes along Monongahela River furnish the only reliable data as to the thickness of this bed. Churn drill records show coal at its horizon throughout the southeastern and central part of the county. It is assumed that this coal underlies the entire county. A thickness of 42 inches has been assumed in the townships along Monongahela River. The county has been divided into several northeast-southwest belts. Arbitrary thicknesses for the Freeport coal have been assumed in each zone. The assigned thickness was regularly decreased westward to a minimum of 24 inches in the northwest part of the county. The quantity recoverable has been estimated as 50 per cent of the whole, from which has been deducted 15 per cent for loss in mining.

Because of the irregularity in thickness and the presence of many partings in the Redstone, Waynesburg, and Washington coals, it is believed that the Freeport bed will yield a larger output than any of these others when the Pittsburgh bed has been exhausted and necessity demands the development of deep-lying beds.

The accessibility for local use of the Redstone, Waynesburg, and Washington coals makes them more important than the Freeport coal at the present time; but if assumptions as to unbroken continuity of this bed throughout the county are correct, the Freeport coal can be considered as second in importance for future commercial use.

Other coals are mined for local use, but as they are very small beds and little is known of their extent and thickness, they are not included in the computation of resources.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the several beds given in the second table from left to right and for the townships from east to west or from northeast to southwest. Thus, while the figures for the Pittsburgh bed are conservative and probably reliable, the figures for the Freeport coal may be much too small or many times too large.

The result of computing the coal resources in Washington County is shown in the following tables:

Coal resources in Washington County

Bed	Original deposit	Mined out and lost	Recoverable
Washington	972,315,000	300,000	212,540,000
Waynesburg	1,914,084,000	700,000	668,380,000
Redstone	158,760,000	600,000	88,000,000
Pittsburgh	5,091,310,000	556,163,000	3,516,860,000
Freeport	2,389,554,000		995,900,000
Total	10,526,023,000	557,763,000	5,481,680,000

Summary of recoverable coal in Washington County

Township or Boro.	Pittsburgh	Redstone	Waynesburg	Washington	Freeport
Allen	2,382,000		180,000		3,000,000
Amwell	208,367,000		110,000,000	27,000,000	61,000,000
Beallsville	13,782,000		5,000,000	360,000	3,000,000
Bentleyville	3,276,000		2,000,000	90,000	3,900,000
Blaine	52,326,000		4,000,000	2,800,000	11,000,000
Buffalo	94,000,000		17,000,000	24,000,000	19,000,000
Canton	65,580,000		8,900,000	6,000,000	13,000,000
Carroll	47,935,000	32,000,000	10,000,000		33,000,000
Cecil	86,860,000		12,000,000	170,000	25,000,000
Centerville	55,575,000		1,700,000		18,000,000
Chartiers	80,290,000		5,000,000	30,000	24,000,000
Cross Creek	110,682,000		2,900,000	4,000,000	24,000,000
Deemston	56,415,000		12,000,000	300,000	16,000,000
Donegal	186,900,000		9,000,000	27,000,000	39,000,0 0
East Bethlehem	328,276,000		2,600,000		8,000,000
East Finley	160,700,000		40,000,000	24,000,000	41,000,000
Elco	680,000				400,000
East Pike Run	29,200,000		3,500,000		23,000,000
Fallowfield	81,600,000	34,000,000	14,000,000		37,000,000
Hanover	33,300,000				45,000,000
Hopewell	89,000,000		8,000,000	7,000,000	19,000,000
Independence	98,600,000		3,000,000	3,000,000	24,000,000
Jefferson	76,380,000		300,000	40,000	23,000,000
Long Branch	2,050,000		300,000		3,000,000
Morris	141,000,000		66,000,000	21,000,000	35,000,000
Mt. Pleasant	147,800,000		5,000,000	3,000,000	33,000,000
North Franklin	35,400,000		8,000,000	5,000,000	8,000,000
North Strabane	122,700,000		19,000,000	5,000,000	33,000,000
Nottingham	80,300,000		8,000,000	800,000	27,000,000
Peters	86,400,000		9,000,000	300,000	23,000,000
Robinson	13,600,000				20,000,000
Roscoe	68,000				1,000,000
Smith	82,400,000		1,000,000		32,000,000
Somerset	122,000,000		41,000,000	2,000,000	46,000,000
South Franklin	100,000,000		39,000,000	15,000,000	25,000,000
South Strabane	108,000,000		31,000,000	11,000,000	27,000,000
Speers	660,000				2,000,000
Stockdale	76,000				600,000
Twilight	3,600,000				2,000,000
Union	34,400,000	22,000,000	1,000,000		22,000,000
Washington	16,000,000		3,000,000	200,000	4,000,000
West Bethlehem	213,000,000		109,000,000	14,000,000	64,000,000
West Finley	166,300,000		44,000,000	9,000,000	46,000,000
West Pike Run	79,000,000		13,000,000	450,000	29,000,000
Total	3,516,860,000	88,000,000	668,380,000	212,540,000	995,900,000

Coal resources in Washington County by townships

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Allen Township							Area 2.4 square miles
Pittsburgh	1.65	14,670,000	11,556,000	2,382,000	90	15	56-100
Waynesburg	.1	360,000		180,000	60	15	40
Freeport	2.4	9,072,000		3,000,000	50	15	42
Total		24,102,000	11,556,000	5,762,000			
Amwell Township							Area 44.3 square miles
Pittsburgh	44.3	272,376,000		208,367,000	90	15	66-72
Waynesburg	44.1	216,630,000		110,000,000	60	15	40-60
Washington	40.0	108,000,000		27,000,000	30	15	30
Freeport	44.3	143,532,000		61,000,000	50	15	36
Total		740,538,000		406,367,000			
Beallsville Boro.							Area 2.7 square miles
Pittsburgh	2.7	18,018,000		13,782,000	90	15	66-84
Waynesburg	2.4	10,170,000		5,000,000	60	15	45-55
Washington	.8	1,440,000		360,000	30	15	20
Freeport	2.7	8,748,000		3,000,000	50	15	36
Total		38,376,000		22,142,000			
Bentleyville Boro.							Area 2.9 square miles
Pittsburgh	2.9	17,748,000	13,464,000	3,276,000	90	15	68
Waynesburg	.9	4,113,000		2,000,000	60	15	32-55
Washington	.2	360,000		90,000	30	15	20
Freeport	2.9	9,396,000		3,900,000	50	15	36
Total		31,617,000	13,464,000	9,266,000			
Blaine Township							Area 12.1 square miles
Pittsburgh	12.1	65,340,000	540,000	52,376,000	95	15	60
Waynesburg	7.2	24,984,000		4,000,000	20	15	32-48
Washington	4.3	16,665,000		2,800,000	20	15	40-45
Freeport	12.1	26,136,000		11,000,000	50	15	24
Total		133,065,000	540,000	70,126,000			
Buffalo Township							Area 21.2 square miles
Pittsburgh	21.2	116,496,000		94,000,000	95	15	60-62
Waynesburg	21.0	69,120,000		17,000,000	30	15	32-40
Washington	18.1	71,235,000		24,000,000	40	15	40-55
Freeport	21.2	45,792,000		19,000,000	50	15	24
Total		302,643,000		154,000,000			
Canton Township							Area 14.8 square miles
Pittsburgh	14.8	81,774,000	558,000	65,580,000	95	15	60-62
Waynesburg	9.5	26,208,000		8,900,000	40	15	26-36
Washington	5.8	24,435,000		6,000,000	30	15	40-55
Freeport	14.8	31,968,000		13,000,000	50	15	24
Total		164,385,000	558,000	93,480,000			

Coal resources in Washington County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thick-ness (Inches)
Carroll Township							Area 20.6 square miles
Pittsburgh	18.2	111,384,000	52,020,000	47,935,000	95	15	68
Redstone	18.0	58,320,000	200,000	32,000,000	70	20	36
Waynesburg	3.6	17,946,000		10,000,000	70	15	45-58
Freeport	20.6	77,868,000		33,000,000	50	15	42
Total		265,518,000	52,220,000	122,935,000			
Cecil Township							Area 28.3 square miles
Pittsburgh	28.1	158,022,000	44,478,000	86,860,000	90	15	60–66
Waynesburg	10.5	23,778,000		12,000,000	60	15	18–26
Washington	.5	2,025,000		170,000	10	15	45
Freeport	28.3	61,128,000		25,000,000	50	15	24
Total		244,953,000	44,478,000	124,030,000			
Centerville Boro.							Area 11.7 square miles
Pittsburgh	11.6	103,248,000	30,600,000	55,575,000	90	15	80–108
Waynesburg	.8	3,519,000		1,700,000	60	15	42–55
Freeport	11.7	44,226,000		18,000,000	50	15	42
Total		150,993,000	30,600,000	75,275,000			
Chartiers Township							Area 26.3 square miles
Pittsburgh	23.0	129,474,000	30,042,000	80,290,000	95	15	60–66
Waynesburg	7.3	17,586,000		5,000,000	40	15	24–32
Washington	.1	450,000		30,000	10	15	50
Freeport	26.3	56,808,000		24,000,000	50	15	24
Total		204,318,000	30,042,000	109,320,000			
Cross Creek Township							Area 26.9 square miles
Pittsburgh	26.5	147,330,000	2,646,000	110,682,000	90	15	55-62
Waynesburg	15.0	34,146,000		2,900,000	10	15	24–32
Washington	5.0	24,750,000		4,000,000	20	15	55
Freeport	26.9	58,104,000		24,000,000	50	15	24
Total		264,330,000	2,646,000	141,582,000			
Deemston Boro.							Area 10.1 square miles
Pittsburgh	10.1	75,366,000	1,620,000	56,415,000	90	15	72–94
Waynesburg	5.7	24,255,000		12,000,000	60	15	40–50
Washington	.6	1,440,000		300,000	30	15	20–30
Freeport	10.1	38,178,000		16,000,000	50	15	42
Total		139,239,000	1,620,000	84,715,000			
Donegal Township							Area 43.1 square miles
Pittsburgh	43.1	232,074,000	540,000	186,900,000	95	15	58–60
Waynesburg	42.0	109,548,000		9,000,000	10	15	10–40
Washington	32.4	106,560,000		27,000,000	30	15	20–60
Freeport	43.1	93,096,000		39,000,000	50	15	24
Total		541,278,000	540,000	261,900,000			

Coal resources in Washington County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
East Bethlehem Township							Area 5.6 square miles
Pittsburgh	5.2	429,120,000		328,276,000	90	15	88–104
Waynesburg	1.0	5,175,000		2,600,000	60	15	50–70
Washington							
Freeport	5.6	21,168,000		8,000,000	50	15	42
Total		455,463,000		338,876,000			
East Finley Township							Area 36.0 square miles
Pittsburgh	36.0	199,008,000		160,700,000	95	15	60–62
Waynesburg	36.0	157,320,000		40,000,000	30	15	40–55
Washington	36.0	97,200,000		24,000,000	30	15	30
Freeport	36.0	97,200,000		41,000,000	50	15	30
Total		550,728,000		265,700,000			
Elco Boro.							Area .3 square miles
Pittsburgh	.2	1,800,000	900,000	680,000	90	15	100
Freeport	.3	1,134,000		400,000	50	15	42
Total		2,934,000	900,000	1,080,000			
East Pike Run Township							Area 14.4 square miles
Pittsburgh	12.6	112,824,000	74,646,000	29,200,000	90	15	92–108
Waynesburg	1.9	6,894,000		3,500,000	60	15	40–42
Freeport	14.4	54,432,000		23,000,000	50	15	42
Total		174,150,000	74,646,000	55,700,000			
Fallowfield Township							Area 23.2 square miles
Pittsburgh	20.4	133,128,000	26,460,000	81,600,000	90	15	68–96
Redstone	19.0	61,560,000	200,000	34,000,000	70	20	36
Waynesburg	5.8	27,594,000		14,000,000	60	15	40–58
Freeport	23.2	87,696,000		37,000,000	50	15	42
Total		309,978,000	26,660,000	166,600,000			
Hanover Township							Area 49.8 square miles
Pittsburgh	10.5	49,644,000	3,510,000	33,300,000	85	15	48–60
Freeport	49.8	107,568,000		45,000,000	50	15	24
Total		157,212,000	3,510,000	78,300,000			
Hopewell Township							Area 21.5 square miles
Pittsburgh	21.5	116,532,000		89,000,000	90	15	60–62
Waynesburg	17.5	50,634,000		8,000,000	20	15	26–48
Washington	9.8	46,800,000		7,000,000	20	15	50–55
Freeport	21.5	46,440,000		19,000,000	50	15	24
Total		260,406,000		123,000,000			

Coal resources in Washington County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Independence Township							Area 26.5 square miles
Pittsburgh	25.5	136,251,000	7,362,000	98,600,000	90	15	50–62
Waynesburg	18.7	45,612,000		3,000,000	10	15	24–32
Washington	8.1	40,095,000		3,000,000	10	15	55
Freeport	26.5	57,240,000		24,000,000	50	15	24
Total		279,198,000	7,362,000	128,600,000			
Jefferson Township							Area 25.2 square miles
Pittsburgh	21.2	107,379,000	7,533,000	76,380,000	90	15	50–62
Waynesburg	1.2	4,536,000		300,000	10	15	36–48
Washington	.1	495,000		40,000	10	15	55
Freeport	25.2	54,432,000		23,000,000	50	15	24
Total		166,842,000	7,533,000	99,720,000			
Long Branch Boro.							Area 2.3 square miles
Pittsburgh	2.3	20,466,000	17,784,000	2,050,000	90	15	98–100
Waynesburg	.2	720,000		300,000	60	15	40
Freeport	2.3	8,694,000		3,000,000	50	15	42
Total		29,880,000	17,784,000	5,350,000			
Morris Township							Area 31.1 square miles
Pittsburgh	31.1	184,518,000		141,000,000	90	15	62–68
Waynesburg	31.1	155,565,000		66,000,000	50	15	50–60
Washington	31.1	83,970,000		21,000,000	30	15	30
Freeport	31.1	83,970,000		35,000,000	50	15	30
Total		508,023,000		263,000,000			
Mt. Pleasant Township							Area 37.0 square miles
Pittsburgh	37.0	199,854,000	16,740,000	147,800,000	95	15	62–68
Waynesburg	14.0	31,734,000		5,000,000	20	15	24–26
Washington	3.5	18,090,000		3,000,000	20	15	50–60
Freeport	37.0	79,920,000		33,000,000	50	15	24
Total		329,598,000	16,740,000	188,800,000			
North Franklin Township							Area 7.5 square miles
Pittsburgh	7.5	43,938,000		35,400,000	95	15	62–66
Waynesburg	7.5	26,262,000		8,000,000	40	15	36–45
Washington	6.4	20,700,000		5,000,000	30	15	30–40
Freeport	7.5	20,250,000		8,000,000	50	15	30
Total		111,150,000		56,400,000			
North Strabane Township							Area 28.8 square miles
Pittsburgh	28.0	166,320,000	14,256,000	122,700,000	95	15	66
Waynesburg	19.7	57,240,000		19,000,000	40	15	26–36
Washington	6.2	19,620,000		5,000,000	30	15	30–40
Freeport	28.8	77,760,000		33,000,000	50	15	30
Total		320,940,000	14,256,000	179,700,000			

Coal resources in Washington County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Nottingham Township							Area 19.8 square miles
Pittsburgh	19.6	117,144,000	12,060,000	80,300,000	90	15	66–68
Waynesburg	8.1	26,172,000		8,000,000	40	15	32–36
Washington	1.0	3,150,000		800,000	30	15	35
Freeport	19.8	64,152,000		27,000,000	50	15	36
Total		210,618,000	12,060,000	116,100,000			
Peters Township							Area 20.2 square miles
Pittsburgh	19.4	115,452,000	2,430,000	86,400,000	90	15	66–68
Waynesburg	10.8	28,422,000		9,000,000	40	15	26–36
Washington	.5	2,025,000		300,000	20	15	45
Freeport	20.2	54,540,000		23,000,000	50	15	30
Total		200,439,000	2,430,000	118,700,000			
Robinson Township							Area 22.3 square miles
Pittsburgh	5.8	32,202,000	13,320,000	13,600,000	85	15	58–62
Freeport	22.3	48,168,000		20,000,000	50	15	24
Total		80,370,000	13,320,000	33,600,000			
Roscoe Boro.							Area .8 square miles
Pittsburgh	.4	3,600,000	2,700,000	68,000	90	15	100
Freeport	.8	3,024,000		1,000,000	50	15	42
Total		6,624,000	2,700,000	1,068,000			
Smith Township							Area 35.5 square miles
Pittsburgh	25.7	142,398,000	34,578,000	82,400,000	90	15	58–62
Waynesburg	5.7	12,798,000		1,000,000	10	15	24–36
Freeport	35.5	76,680,000		32,000,000	50	15	24
Total		231,876,000	34,578,000	115,400,000			
Somerset Township							Area 34.1 square miles
Pittsburgh	34.1	203,058,000	43,524,000	122,000,000	90	15	66–68
Waynesburg	23.0	97,533,000		41,000,000	50	15	36–60
Washington	4.3	11,160,000		2,000,000	20	15	20–30
Freeport	34.1	110,484,000		46,000,000	50	15	36
Total		422,235,000	43,524,000	211,000,000			

Coal resources in Washington County by townships—Continued

South Franklin Township — Area 22.4 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Pittsburgh	22.4	130,860,000		100,000,000	90	15	62–66
Waynesburg	22.4	94,095,000		39,000,000	50	15	40–55
Washington	22.0	59,400,000		15,000,000	30	15	30
Freeport	22.4	60,480,000		25,000,000	50	15	30
Total		344,835,000		179,000,000			

South Strabane Township — Area 24.1 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Pittsburgh	24.1	142,722,000	1,188,000	108,000,000	90	15	62–66
Waynesburg	22.5	74,988,000		31,000,000	50	15	32–45
Washington	16.5	44,550,000		11,000,000	30	15	30
Freeport	24.1	65,070,000		27,000,000	50	15	30
Total		327,330,000	1,188,000	177,000,000			

Speers Boro. — Area 1.4 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Pittsburgh	.6	5,184,000	4,320,000	660,000	90	15	96
Freeport	1.4	5,292,000		2,000,000	50	15	42
Total		10,476,000	4,320,000	2,660,000			

Stockdale Boro. — Area .4 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Pittsburgh	.1	900,000	800,000	76,000	90	15	100
Freeport	.4	1,512,000		600,000	50	15	42
Total		2,412,000	800,000	676,000			

Twilight Boro. — Area 1.4 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Pittsburgh	.96	8,236,000	3,456,000	3,600,000	90	15	92–96
Freeport	1.4	5,292,000		2,000,000	50	15	42
Total		13,528,000	3,456,000	5,600,000			

Union Township — Area 16.7 square miles

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Pittsburgh	12.7	79,434,000	34,434,000	34,400,000	90	15	66–72
Redstone	12.0	38,880,000	200,000	22,000,000	70	20	36
Waynesburg	1.0	3,276,000		1,000,000	40	15	32–40
Freeport	16.7	54,108,000		22,000,000	50	15	36
Total		175,698,000	34,634,000	79,400,000			

Coal resources in Washington County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
Washington Boro.							Area 3.5 square miles
Pittsburgh	3.5	20,430,000	558,000	16,000,000	95	15	62-66
Waynesburg	2.5	8,100,000	324,000	3,000,000	50	15	36
Washington	.2	900,000	----------	200,000	30	15	50
Freeport	3.5	9,450,000	----------	4,000,000	50	15	30
Total	----------	38,880,000	882,000	23,200,000	----------	----------	----------

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
West Bethlehem Township							Area 46.5 square miles
Pittsburgh	46.5	291,582,000	12,780,000	213,000,000	90	15	66-80
Waynesburg	45.2	215,055,000	----------	109,000,000	60	15	45-60
Washington	21.5	55,170,000	----------	14,000,000	30	15	20-30
Freeport	46.5	150,660,000	----------	64,000,000	50	15	36
Total	----------	712,467,000	12,780,000	400,000,000	----------	----------	----------

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
West Finley Township							Area 40.7 square miles
Pittsburgh	40.7	217,404,000	----------	166,300,000	90	15	58-60
Waynesburg	40.7	171,879,000	376,000	44,000,000	30	15	40-55
Washington	40.7	169,890,000	300,000	9,000,000	10	15	30
Freeport	40.7	109,890,000	----------	46,000,000	50	15	30
Total	----------	612,063,000	676,000	265,300,000	----------	----------	----------

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining loss per cent	Range of thickness (Inches)
West Pike Run Township							Area 18.2 square miles
Pittsburgh	17.7	136,602,000	32,760,000	79,000,000	90	15	66-98
Waynesburg	5.8	27,117,000	----------	13,000,000	60	15	45-60
Washington	1.0	1,800,000	----------	450,000	30	15	20
Freeport	18.2	68,796,000	----------	29,000,000	50	15	42
Total	----------	234,315,000	32,760,000	121,450,000	----------	----------	----------

WESTMORELAND COUNTY

By
John F. Reese

INTRODUCTION

Westmoreland County is one of the largest soft coal producing counties in the State. With Fayette County, it produces one-third of the bituminous coal mined in Pennsylvania.

The Pittsburgh bed leads in production. It is thick and has good quality wherever it occurs. Mining of this bed is rapidly exhausting it. The Brookville, Lower Kittanning, Middle Kittanning, Lower Freeport and Upper Freeport beds, lying below the Pittsburgh, are also workable locally. The Redstone coal, lying above the Pittsburgh, has come into importance as a producer within the last few years.

Westmoreland County is literally dotted with coal mining towns. Even the larger cities depend upon coal mining as their chief supporting industry. Railroad facilities are excellent, and Westmoreland County coal is always in demand for gas, steam and coke making.

COAL BEDS

Westmoreland County has six beds that are now of economic interest. In order of present importance as shipping coals they are the Pittsburgh, Upper Freeport, Redstone, Lower Kittanning, Middle Kittanning, and Waynesburg.

Pittsburgh coal. The great development of this bed, and numerous exposures of its outcrop have furnished many reliable measurements of the thickness, thus making possible an accurate and reliable computation of the quantity of coal contained in this bed. No information is available as to the size of mined-out areas in some localities. For these places an estimate of probable depletion has been made, based on age and size of operation, or on the difference between original areas and statements of acreages remaining unmined.

Upper Freeport coal. This bed contains the greatest resource within the county. The extensive development of this coal along the Kiskiminitas and Allegheny rivers, the outcrop throughout the county, and drill hole records, have furnished a fair number of detailed measurements of its thickness. From data available, a fairly

accurate map of this bed has been made showing the extent of the thick Freeport coal, the large faulted area in the central and western part of the county; and the local faults along Kiskiminitas River.

Because of the approaching exhaustion of the Pittsburgh coal, this bed will be first in economic importance within a few years.

Redstone coal. This bed is of economic value in five townships. A fair number of measurements from its outcrop and from several mines have made possible a fairly accurate estimate of the tonnage. A low percentage of recovery has been assumed for this bed, because when the Pittsburgh coal has been mined, the intervening rocks will cave, thus breaking the bed and making recovery of this coal both difficult and costly.

Lower Kittanning coal. This bed has economic importance in five townships, all lying east of Chestnut Ridge. A fair number of measurements are available from its outcrop, and from mines along Conemaugh River. Available drill-hole records show this coal to be extremely variable in thickness and of no economic value west of Chestnut Ridge.

Middle Kittanning coal. Drill-hole records show this coal to be fairly persistent and of fair thickness in the western part of the county. An average thickness of 3 feet has been used in eight townships where its existence has been established. A recovery of only 50 per cent has been assumed for this bed, because of meager data regarding its thickness and continuity.

Waynesburg coal. A number of measurements have been made on the outcrop, and in the mines of this coal. It has importance in Hempfield and Sewickley townships. This bed is broken by many partings, is variable in section, and in places is under shallow cover. For these reasons a low percentage of recovery has been used in figuring the mineable tonnage. This coal is mined for domestic use in many places because it is readily accessible.

Other coal beds are mined for local use, but as they are not important, and little is known of their extent and thickness, they have not been included in the computation of the reserves.

COAL RESOURCES

The reliability of the average thickness of the coals used in the computation of tonnage decreases for the beds in the order following: Pittsburgh, Upper Freeport, Redstone, Waynesburg, Lower Kittanning, and Middle Kittanning. Thus, while the figures for the Pittsburgh bed are conservative, and probably reliable, the figures for the Middle Kittanning coal may be much too small or many times too large.

Coal resources in Westmoreland County

Bed	Original deposit	Mined out	Recoverable
Waynesburg	15,822,000	810,000	7,600,000
Redstone	324,900,000	2,970,000	163,200,000
Pittsburgh	1,872,540,000	1,167,687,000	538,300,000
Upper Freeport	2,732,598,000	45,378,000	1,859,200,000
Middle Kittanning	706,644,000	324,000	297,500,000
Lower Kittanning	729,000,000	972,000	431,700,000
Total	6,381,504,000	1,218,141,000	3,297,500,000

Summary of recoverable coal in Westmoreland County

Township	Pittsburgh	Upper Freeport	Redstone	Lower Kittanning	Middle Kittanning	Waynesburg
Allegheny		62,400,000			42,500,000	
Bell	5,000,000	58,300,000				
Cook		67,400,000		76,900,000		
Derry	30,400,000	205,700,000				
Donegal		63,300,000		63,500,000		
E. Huntingdon	23,100,000	100,600,000				
Fairfield	5,300,000	124,400,000		96,300,000		
Franklin	12,800,000	9,300,000			52,000,000	
Hempfield	62,000,000	163,000,000	10,700,000			2,000,000
Ligonier	5,300,000	156,000,000		154,000,000		
Lower Burrell		5,200,000			23,000,000	
Loyalhanna	9,200,000	66,000,000				
Mt. Pleasant	55,300,000	111,000,000				
N. Huntingdon	22,900,000	14,000,000	10,000,000		40,000,000	
Penn	43,800,000				48,000,000	
Rostraver	62,700,000	114,000,000	65,000,000			
St. Clair		59,000,000		41,000,000		
Salem	35,900,000	33,000,000				
Sewickley	46,900,000	83,000,000	45,000,000		39,000,000	5,600,000
S. Huntingdon	53,900,000	112,000,000	32,500,000			
Unity	62,800,000	117,000,000				
Upper Burrell		53,000,000			21,000,000	
Washington	1,000,000	81,000,000			32,000,000	
Total	538,300,000	1,859,200,000	163,200,000	431,700,000	297,500,000	7,600,000

Coal resources in Westmoreland County by townships

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining lost per cent	Thickness (inches)
Allegheny Township							**Area 34.5 square miles**
U. Freeport	26.3	100,566,000	18,900,000	62,400,000	90	15	42–50
M. Kittanning	31.0	100,440,000	324,000	42,500,000	50	15	36
Total		201,006,000	19,224,000	104,900,000			
Bell Township							**Area 23.9 square miles**
Pittsburgh	1.3	9,684,000	3,024,000	5,000,000	90	15	80–84
U. Freeport	18.9	83,700,000	7,416,000	58,300,000	90	15	44–52
Total		93,384,000	10,440,000	63,300,000			

Coal resources in Westmoreland County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining lost per cent	Thickness (inches)
Cook Township							Area 47.3 square miles
U. Freeport	24.2	88,236,000		67,400,000	90	15	34–46
L. Kittanning	40.0	129,600,000	324,000	76,900,000	70	15	36
Total		217,836,000	324,000	144,300,000			
Derry Township							Area 101.8 square miles
Pittsburgh	19.7	146,862,000	107,100,000	30,400,000	90	15	72–92
U. Freeport	68.2	303,516,000	1,008,000	205,700,000	80	15	40–70
Total		450,378,000	108,108,000	236,100,000			
Donegal Township							Area 50.5 square miles
U. Freeport	24.0	72,000,000	270,000	63,300,000	90	15	30–38
L. Kittanning	33.0	106,920,000		63,500,000	70	15	36
Total		178,920,000	270,000	126,800,000			
E. Huntingdon Township							Area 34.8 square miles
Pittsburgh	10.6	92,340,000	62,136,000	23,100,000	90	15	94–108
U. Freeport	33.0	148,500,000	450,000	100,600,000	80	15	50
Total		240,840,000	62,586,000	123,700,000			
Fairfield Township							Area 64.6 square miles
Pittsburgh	2.4	16,848,000	9,828,000	5,300,000	90	15	78
U. Freeport	39.0	166,608,000	3,888,000	124,400,000	90	15	44–54
L. Kittanning	50.0	162,000,000		96,300,000	70	15	36
Total		345,456,000	13,716,000	226,000,000			
Franklin Township							Area 37.8 square miles
Pittsburgh	6.7	48,312,000	31,464,000	12,800,000	90	15	76–88
U. Freeport	2.0	12,240,000		9,300,000	90	15	68
M. Kittanning	37.8	122,472,000		52,000,000	50	15	36
Total		183,024,000	31,464.000	74,100,000			
Hempfield Township							Area 90.5 square miles
Pittsburgh	27.7	211,410,000	130,320,000	62,000,000	90	15	72–94
U. Freeport	58.0	242,838,000	1,854,000	163,000,000	80	15	32–60
Redstone	6.3	21,618,000	882,000	10,700,000	60	15	28–54
Waynesburg	1.4	4,212,000	270,000	2,000,000	60	15	30–60
Total		480,078,000	133,326,000	237,700,000			

Coal resources in Westmoreland County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining lost per cent	Thickness (inches)
Ligonier Township							Area 98.8 square miles
Pittsburgh	2.6	18,252,000	11,232,000	5,300,000	90	15	78
U. Freeport	50.5	205,056,000	432,000	156,000,000	90	15	20–48
L. Kittanning	80.0	259,200,000		154,000,000	70	15	36
Total		482,508,000	11,664,000	315,300,000			
Lower Burrell Township							Area 16.8 square miles
U. Freeport	15.3	78,120,000	9,090,000	5,200,000	90	15	42–68
M. Kittanning	16.8	54,432,000		23,000,000	50	15	36
Total		132,552,000	9,090,000	28,200,000			
Loyalhanna Township							Area 22.4 square miles
Pittsburgh	1.9	14,328,000	2,196,000	9,200,000	90	15	76–88
U. Freeport	20.5	86,868,000		66,000,000	90	15	36–50
Total		101,196,000	2,196,000	75,200,000			
Mt. Pleasant Township							Area 54.0 square miles
Pittsburgh	25.2	217,872,000	145,458,000	55,300,000	90	15	90–108
U. Freeport	37.3	164,214,000		111,000,000	80	15	30–50
Total		382,086,000	145,458,000	166,300,000			
N. Huntingdon Township							Area 29.3 square miles
Pittsburgh	20.5	147,321,000	117,342,000	22,900,000	90	15	68–95
U. Freeport	6.8	20,808,000		14,000,000	80	15	32–46
Redstone	8.3	20,970,000		10,000,000	60	15	28–30
M. Kittanning	29.3	94,932,000		40,000,000	50	15	36
Total		284,031,000	117,342,000	86,900,000			
Penn Township							Area 35.5 square miles
Pittsburgh	18.8	136,701,000	79,407,000	43,800,000	90	15	68–82
M. Kittanning	35.5	115,020,000		48,000,000	50	15	36
Total		251,721,000	79,407,000	91,800,000			
Rostraver Township							Area 37.5 square miles
Pittsburgh	32.5	243,756,000	161,748,000	62,700,000	90	15	68–104
U. Freeport	37.5	168,750,000		114,000,000	80	15	50
Redstone	32.3	128,610,000	864,000	65,000,000	60	15	36–48
Total		541,116,000	162,612,000	241,700,000			

Coal resources in Westmoreland County by townships—Continued

Bed	Area (sq. mi.)	Original deposit	Mined out and lost	Recoverable	Mining per cent	Mining lost per cent	Thickness (inches)
St. Clair Township							Area 36.8 square miles
U. Freeport	17.0	78,120,000		59,000,000	90	15	48–52
L. Kittanning	22.0	71,280,000	648,000	41,000,000	70	15	36
Total		149,400,000	648,000	100,000,000			
Salem Township							Area 49.7 square miles
Pittsburgh	13.3	109,224,000	62,226,000	35,900,000	90	15	72–92
U. Freeport	11.0	49,500,000		33,600,000	80	15	50
Total		158,724,000	62,226,000	69,500,000			
Sewickley Township							Area 28.4 square miles
Pittsburgh	24.3	159,012,000	97,632,000	46,900,000	90	15	68–85
U. Freeport	28.4	122,778,000		83,000,000	80	15	34–70
Redstone	22.5	89,334,000	792,000	45,000,000	60	15	28–48
M. Kittanning	28.4	92,016,000		39,000,000	50	15	36
Waynesburg	3.0	11,610,000	540,000	5,600,000	60	15	24–60
Total		474,750,000	98,964,000	219,500,000			
South Huntingdon Township							Area 46.6 square miles
Pittsburgh	18.2	135,900,000	65,358,000	53,900,000	90	15	68–94
U. Freeport	42.1	190,116,000	900,000	112,000,000	70	15	48–60
Redstone	14.9	64,368,000	432,000	32,500,000	60	15	48
Total		390,384,000	66,690,000	198,400,000			
Unity Township							Area 71.9 square miles
Pittsburgh	18.8	161,298,000	79,164,000	62,800,000	90	15	84–100
U. Freeport	38.6	172,404,000		117,000,000	80	15	46–50
Total		333,702,000	79,164,000	179,800,000			
Upper Burrell Township							Area 15.3 square miles
Pittsburgh	.2	1,368,000	1,368,000		90	15	76
U. Freeport	14.6	69,336,000		53,000,000	90	15	44–68
M. Kittanning	15.3	49,572,000		21,000,000	50	15	36
Total		120,276,000	1,368,000	74,000,000			
Washington Township							Area 33.9 square miles
Pittsburgh	.3	2,052,000	684,000	1,000,000	90	15	76
U. Freeport	23.9	108,324,000	1,170,000	81,000,000	90	15	42–52
M. Kittanning	24.0	77,760,000	324,000	32,000,000	50	15	36
Total		188,136,000	2,178,000	114,000,000			

PENNSYLVANIA
GEOLOGICAL SURVEY
FOURTH SERIES

BITUMINOUS COAL FIELDS OF PENNSYLVANIA

INTRODUCTION
PART IV.

COAL ANALYSES

Prepared by the
UNITED STATES BUREAU OF MINES

Department of Forests and Waters
R. Y. Stuart, Secretary

Topographic and Geologic Survey
Geo. H. Ashley, State Geologist

PREFACE

One of the important functions of the U. S. Bureau of Mines, Department of the Interior, has been the analyzing of samples of coal from every coal-mining State and from Alaska. The analyses are being published for the information of Government officials and the public.

These samples have been collected in mines by representatives of the Bureau of Mines and by geologists of the U. S. Geological Survey in investigations of mineral resources; they have been collected from coal delivered for the use of Government Departments—Treasury, Navy, and War—and for various Government institutions; they have also come from coal obtained for tests by the Bureau in investigating the utilization of fuel and the explosibility of coal dust. Many samples have been collected and analyzed in connection with the work of various State geological surveys, in the case of this publication particularly the Pennsylvania Topographic and Geologic Survey, which is printing it.

From time to time the Bureau of Mines has published the analytical results in large bulletins. Although the analyses in any one bulletin are grouped together by States, or by special uses, to look up the analyses of coals from any particular section of the country necessitates the perusal of a number of bulletins, some of which are no longer available for free distribution.

Moreover, when the Bureau receives an inquiry for analyses of coal from any desired part of the country, it constitutes a large wastage of printed documents to send a number of bulletins in order to show the analyses for only one mining district in a State, or even for an individual mine. It therefore is deemed expedient to republish the analyses of coal in a series of inexpensive publications, by separate States.

Bureau of Mines Techincal Paper 269 on Iowa coals was the first of the series to be issued; this paper on Pennsylvania coals is the sixth, the others in order being Kentucky, Ohio, Utah, and Alabama.

H. Foster Bain

Director, Bureau of Mines,

Department of the Interior.

ANALYSES OF PENNSYLVANIA BITUMINOUS COAL

Prepared by United States Bureau of Mines

INTRODUCTION

By Geo. H. Ashley

This paper which gives analyses of Pennsylvania coals with a description of the mines from which samples were taken, constitutes Part IV of the Introduction to a report on the Coal Fields of Pennsylvania. Part I will consist of a general description of the original occurrence of coal and the salient features of the coal fields of Pennsylvania, by the State Geologist; Part II will contain a more detailed description of the fields by counties, by J. D. Sisler; and Part III will give estimates of bituminous coal reserves, by John F. Reese. The analyses here given are of samples taken by members of the U. S. Bureau of Mines, the U. S. Geological Survey, and the Pennsylvania Geological Survey. Sampling for the State Survey was done by Prof. Erle G. Hill, University of Pittsburgh, who took 254 samples in 84 mines; by Mr. L. D. Woodworth, Carnegie Institute of Technology, who took 486 samples in 175 mines, and by J. D. Sisler, who, during 1923, took 15 samples in 12 mines. The samples taken by the State Survey were selected so as to fill geographic gaps left in previous sampling by the Federal Bureaus, and to have data on coal beds not previously tested. It is hoped that in the future this work may be continued and samples taken in all mines of the State, and of all beds in all parts of the State that promise workable coal

Acknowledgment is made to the United States Bureau of Mines for the preparation of this manuscript, and for the opportunity to publish it. The manuscript was edited by R. W. Stone.

May, 1924.

GEOLOGY OF PENNSYLVANIA BITUMINOUS COALS

By JAMES D. SISLER[1]

Location and Age

The main bituminous coal field of Pennsylvania lies in approximately twenty counties west of the mountain area which extends in a northeast-southwest direction through the central part of the Commonwealth.

The coal fields lie in a dissected peneplain, still in the youthful stage of erosion. There are numerous V-shaped valleys in the bituminous fields and the tributaries of the larger streams have rather steep gradients. The main streams flow in rather narrow valleys with comparatively small flood plains

The coal beds of Pennsylvania are of Carboniferous age, and are confined to two systems, the Permain and the Pennsylvanian. The latter system is divided into an upper or Pittsburgh series and a lower of Pottsville series. The Permain system is divided into an upper and lower series. The Pottsville series of the Pennsylvanian is represented in western Pennsylvania by the Upper Pottsville only. The upper or Pittsburgh series of the Pennsylvanian is represented by the Monongahela, Conemaugh, and Allegheny groups.

Geologic Structure

The rocks of the bituminous coal fields are folded into many anticlines and synclines extending in a general northeast direction across the western part of Pennsylvania. The intensity of this folding increases toward the mountain region. West of Chestnut Ridge, which is in Fayette, Westmoreland, and Indiana counties, the folding is minor, and the coal beds have low dips. East of Chestnut Ridge, where folding is stronger, the basins are wider and the coal beds rise steeply on the flanks of the anticlines.

Geology

The bituminous coals of Pennsylvania are associated with shale, sandstone, clay, and limestone. Each group has different proportions of these deposits, and the proportions vary at different localities within the same group.

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[1]Associate geologist, Chief of Coal Division, Pennsylvania Topographic and Geologic Survey.

Pottsville Series

This series is largely sandstone, which is conglomeritic in extensive areas. It is practically barren of large workable coal beds. The Sharon and Mercer beds are workable in Lawrence and Mercer counties, but are now practically exhausted. The Alton coal group, the exact correlation of which is uncertain, lies near the top of the Pottsville series. Some of these coals may be workable in the future near the northern edge of the bituminous field in central Pennsylvania.

Allegheny Group

This group contains more mineable coal beds than any other group in Pennsylvania, and practically 50 per cent of the bituminous coal production comes from it. The main outcrop is in Westmoreland, Somerset, Cambria, Clearfield, Jefferson, Indiana, Clarion, Armstrong, Lawrence, and Beaver counties. The group ranges from 250 to 350 feet in thickness, averaging approximately 300 feet.

The mineable coals are, in ascending order, Brookville, Clarion, Lower, Middle, and Upper Kittanning, and Lower and Upper Freeport.

The Brookville is usually dirty, and ranges from a few inches to 8 feet thick. It has local importance in Cambria, Somerset, Armstrong, Butler, Clarion, Jefferson, Indiana, Elk, Clearfield, and Centre counties.

The Clarion coal is generally a thin bed, high in sulphur and ash, but locally is double and workable. Its best development is near its type locality at Clarion, Clarion County. It is also locally mineable in Butler and Armstrong counties.

The Lower Kittanning is probably the most persistent coal bed in the Allegheny group. It is seldom under 15 inches thick, and rarely exceeds 7 feet. The variation is not in the main bench, but in the presence or absence of lower benches. In areas where it is being mined at present it averages approximately 3½ feet. Rarely is the bed entirely clean, for it carries partings and binders that vary in thickness and character in different mining localities. The Lower Kittanning is important in eastern Fayette, Somerset, Indiana, Cambria, Clearfield, Jefferson, Armstrong, and Butler counties. It is deep under cover in the southwestern counties of Pennsylvania.

The Middle Kittanning coal is not persistent in Pennsylvania. It ranges from a few inches to 4 feet thick, and is being mined at a number of places in Clearfield County, where it is regular in thickness. It is also mined in Beaver County, where it is known as the Darlington coal. Its correlation is uncertain.

The Upper Kittanning is generally unimportant in most of the bituminous coal districts. It ranges from a few inches to 7 feet thick.

Its greatest thickness and best quality are in southern Cambria and northern Somerset Counties, where it is now being mined extensively. It is also locally important in Beaver County, where it is a true cannel coal. It is being mined locally in Armstrong, Jefferson, Clarion, and Clearfield counties. The Upper Kittanning is deep under cover in the southwestern counties of Pennsylvania, and little is known of its thickness or value, but it is probably workable in some areas.

The Lower Freeport is variable in thickness, ranging from a few inches to 16 feet. It is locally known as the Moshannon in Clearfield County, and has produced large quantities of excellent smokeless steam coal. It is the main bed of the Punxsutawney-Reynoldsville-Dubois area, where it is from 4 to 11 feet thick. It is also being mined in Cambria County on the Conemaugh and in the vicinity of Barnesboro. It is extremely variable in thickness in other parts of the bituminous field, and is mined locally where its thickness permits of commercial development. The bed is much split in most localities. Drill-hole records in southwestern Pennsylvania indicate that it is rarely of mineable thickness.

The Upper Freeport is one of the most persistent and valuable beds in the Allegheny group. Its physical character is extremely variable. It ranges from a few inches to 9 feet thick, but in general it averages about 4 feet where mined. It usually contains two or more shale or bone partings, and is seldom entirely clean. The chief production from this bed is in Cambria, Somerset, Clearfield, Jefferson, Armstrong, Indiana, and Allegheny counties. It is a thick bed at numerous localities in southwestern Pennsylvania, but its development has been hindered by the presence of the valuable and more easily accessible Pittsburgh bed.

Conemaugh Group

This group ranges from 500 to 900 feet thick and is distinguished from the over- and underlying formations by the presence of thick beds of red shale. This group is thickest in Somerset County. The thickness decreases westward to less than 500 feet in eastern Ohio.

This group contains about twenty coal beds, most of which average less than 12 inches in thickness. The Bakerstown, Harlem, and Wellersburg coals are locally mineable, but their present use is restricted entirely to local domestic fuel. These beds range from a few inches to 4 feet thick, averaging less than 3 feet thick where mined.

Monongahela Group

This group includes the strata between the top of the Waynesburg coal and the base of the Pittsburgh. It ranges from 200 to 375 feet in thickness. It is thickest on the Monongahela River and thinnest on the Ohio-Pennsylvania State line.

The outcrop of this group is confined to Washington, Beaver, Allegheny, Indiana, Westmoreland, Fayette, and Somerset counties. The group is under cover in the southern part of Washington County and practically all of Greene, except along the Monongahela River.

The Waynesburg coal, at the top of this formation, is important in some localities, particularly when demand is excessive. It ranges from 2 to 10 feet thick, and is much parted by clay, bone, and shale. At many localities fully half of the bed is impurities.

The Sewickley coal, lying below the Waynesburg, ranges from a few inches to 6 feet. It is most important in the vicinity of Mapletown in southeastern Greene County. It is also mined locally in Fayette, Washington, Westmoreland, and Somerset counties.

The Redstone coal, lying from 30 to 90 feet above the Pittsburgh coal, ranges from a few inches to 6½ feet thick. The variation in thickness is both great and abrupt, making mining unprofitable in most localities. It is being mined locally in Greene, Washington, Fayette, and Westmoreland counties.

The Pittsburgh coal, at the base of the Monongahela group, is the best known and most valuable coal in southwestern Pennsylvania. It is persistent, ranging from 4 to 16 feet in thickness, but averaging about 7 feet. Its uses are varied. It is standard coking coal in the Connellsville basin of Westmoreland and Fayette counties; it is a high grade of illuminating gas coal in the Irwin basin of Westmoreland County; in Greene, southern Washington, and western Fayette counties it is an excellent by-product coking coal; and in western Washington and Allegheny counties it is high-grade steam coal.

The Pittsburgh bed is characteristically divided into a roof and main division. The latter is usually split into four benches by thin bone or shale partings. The roof division is rarely of mineable quality because of numerous bone, clay, and shale partings.

A bed lying 10 to 28 feet above the Pittsburgh in Somerset county, is probably the Pittsburgh Rider, and not the Redstone. It is an important commercial bed, averaging 4 feet thick.

Permian Coals

The Permian coals outcrop only in Greene and Washington counties. They are usually thin and dirty, and have practically no commercial importance at present. Farmers mine them locally for house fuel.

Sequence and correlation of coal beds

Group	Names of beds
Washington	Washington Waynesburg A
Monongahela	Waynesburg Uniontown Sewickley Redstone Pittsburgh
Conemaugh	Morantown Little Pittsburgh Franklin Lonaconing Hoffman Clarysville Wellersburg Barton Duquesne Harlem Bakerstown, Upper Bakerstown. Lower Brush Creek Gallitzin Mahoning
Allegheny	Upper Freeport, E, Kelly Lower Freeport, D, Moshannon, Dudley Upper Kittanning, C′, Barnettstown, Seymour Middle Kittanning, C, Twin Bed, Morgan Lower Kittanning, B, Barnett, Bloss, Miller Scrubgrass Clarion, A′, Fulton Brookville, A, Gordon, Bear Creek
Pottsville	Homewood, Tionesta (?) Upper Mercer, Upper Alton Lower Mercer, Lower Alton Quakertown Sharon

CHARACTER, USES AND MARKETS OF PENNSYLVANIA BITUMINOUS COALS.

By George H. Ashley

Character

The bituminous coals of Pennsylvania range from low volatile to high volatile, but are all low-moisture coals. The coals are of three types: caking or coking, noncaking or splint, and cannel. The percentage of volatile matter in all kinds changes from low at the east to high at the west. This change is thought to be due to the pressure and folding to which the coals along with the other rocks have been subjected. In the Broad Top field, and in Somerset, Cambria, Clearfield, Centre, and other counties to the northeast, most coals contain from 3 to 5 times as much fixed carbon as volatile matter, the fixed carbon ranging from 67 to 75 per cent, and the volatile matter from 16 to 24 per cent. These coals are classed as lovol coals. In the line of counties just west of those listed the coals are of the medium volatile class (midvols). This includes the famous Connellsville coking coal. Still farther west, covering most of Washington and Westmoreland counties, and the counties to the north of them are high volatile coals or gas coals (hivols). This is discussed in Part I on the geology of the coals of Pennsylvania, where is given an isocarb map.

Cannel coals are found in many parts of the bituminous coal field of Pennsylvania, but in particular in Beaver, Butler, Armstrong, Indiana, and Clearfield counties. The cannels of Beaver and Butler counties are typical high-volatile cannels, many of which have been used in times past for oil distillation. The cannels of Armstrong and Indiana counties are medium volatile cannels, and while maintaining the physical character of cannels, have no more volatile matter than the coals around them. The cannels of Clearfield County are low-volatile.

Splint coals or noncaking coals are not abundant in Pennsylvania. The Sharon coal, formerly mined in Mercer County, was a noncaking or splint or block coal, and was formerly used in the raw state in iron smelting.

Uses

Steam Coal

Practically all of the coals of Pennsylvania are steam coals, though many coals in the Commonwealth, because of high ash, are not good steam coals. The coal of the Pittsburgh district has long been famous

as a steam coal. Its strong, blocky character served excellently in the furnaces of the past. With the introduction of automatic stokers, and the use of powdered coal, these characters do not give it the same great advantage as formerly over the more tender eastern coals which have a higher heating value and find ready market. The Pittsburgh district coal probably remains the best locomotive coal under present practice as the more tender coals tend to blow out of the smokestack.

Bunker Coal

For steamship use low volatile coals of the mountain counties have long been favorites. Possibly the lower freight rate from the eastern counties has had something to do with this demand. This includes the coals from the Broad Top field, and from Somerset, Cambria, Clearfield, and Centre counties in particular.

Coke And Gas Making

As these uses are discussed elsewhere by Mr. J. D. Davis, it is only necessary to note that the midvol coals of eastern Fayette and Westmoreland counties, and of Indiana and Jefferson counties, are ideal for making beehive coke, while the coals from the lower Youghiogheny Valley and the Monongahela River as far up as Brownsville have long been famous as Pittsburgh or "Youghiogheny" gas coal.

Cement Burning

Coal for cement burning must be high in volatile matter, as a long flame is necessary. As the coal is pulverized, soft coals even of medium ash content may be used. Practically all of the high volatile coals of Pennsylvania may serve for this use.

Domestic Coals

While all coals may be, and are, used for domestic purposes, the term is usually confined to open-burning or noncaking coals. All of the cannel coals fall in this category. Of the low volatile coals those from the Broad Top field are generally credited as most nearly meeting competition with anthracite for household use.

Powdered Coal

The growing use of coal in powdered form leads to increased inquiry regarding such coal. While practically all coals may be so used, experience has shown that the best results are obtained by using high volatile, low ash, low-moisture coals. The tender coals of the eastern counties have the advantage of costing less to pulverize, but lack in quantity of volatile matter. Under proper conditions high-ash coals may be used in this way.

Smithing Coal

The low-volatile coals of Somerset and Cambria counties have long been favorites as smithing coals. Such coal should be low in sulphur and high in B. t. u's. Certain districts in the counties mentioned have built up a widespread trade in coals for smithing.

Markets

Because of the high grade and low moisture content and high heating value, Pennsylvania bituminous coals find a widespread market. The coals of the Broad Top field and mountain counties go eastward to Philadelphia, New York, and New England, and to tidewater for export and bunker use. Some coal from Cambria and Somerset counties goes by the Baltimore and Ohio Railroad to Baltimore, and from those counties and Clearfield and Centre counties to Philadelphia by the Pennsylvania Railroad for export to Holland, Switzerland, Panama Canal, and South America in particular; also for water transport to New York and New England. The same counties, and in addition Elk, Jefferson, Indiana, and Armstrong, ship by rail to New York, New England, and Canada via the Pennsylvania Railroad, the New York Central, the Buffalo, Rochester and Pittsburgh, the Erie, and other roads.

Coal from the western part of Pennsylvania goes by rail to Lake Erie points, thence by boat up the lakes to Chicago, Duluth, and the northwest, and into central and western Canada; or by boat down the Ohio to Ohio and Mississippi river points and adjacent territory. To a smaller extent Pittsburgh coal goes by rail to points in Ohio and Indiana in competition with coals from the fields of those States. Smithing coal from Somerset and Cambria counties is shipped to all parts of the United States.

MINING METHODS AND TRANSPORTATION IN PENNSYLVANIA

By J. W. Paul[3]

The method of mining bituminous coal in Pennsylvania cannot be treated in an extended manner in this publication since this would require more space than justified.

The general plan of operation of most mines is on the room-and-pillar system, using double entries from which the rooms are driven. In the early mining in the Pittsburgh coal bed the "checkerboard" plan was much used, but this entailed a large loss of coal in the blocks of coal that were left standing.

In recent years there has been a tendency towards the adoption of the panel, room-and-pillar method, also the block system, which admits of concentrated mining within a relatively small section of the mine. It is not unusual to use 4, 6, or 8 parallel entries for the panel development.

The longwall advancing method has been tried in some of the thin beds of the central coal field, but so far it has not passed beyond the experimental stage.

The average extraction[4] of coal throughout the State is 71.4 per cent, but it is estimated that 15.5 per cent of the loss is avoidable, so the actual extraction should approximate 87 per cent.

Pennsylvania is exceptionally well provided with means of transportation by trunk lines, branches, and by intra-State railroads, among which are the Pennsylvania; Baltimore & Ohio; New York Central; Buffalo, Rochester & Pittsburgh; Western Maryland; Bessemer & Lake Erie; Pittsburgh & West Virginia; Pittsburgh & Lake Erie; Erie; Monongahela Division; and Montour railroads, all of which reach some of the bituminous mines. The Monongahela River furnishes water transportation for Allegheny, Greene, Fayette, and Washington counties. During 1923 the coal traffic on this river amounted to 18,709,084 tons, and of coke, 385,426 tons. Coal is moved on the Allegheny River also, the total in 1923 being 911,178 tons.[5]

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[3]Chief coal mining engineer, Bureau of Mines.
[4]Sisler, J. D., Bituminous coal losses and mining methods in Pennsylvania: Penn. Topo. & Geol. Survey Bull. M. 4, p. 27, 1924.
[5]Figures from U. S. Engineers Office, Pittsburgh, Pa.

COKE AND GAS FROM PENNSYLVANIA COALS

By J. D. Davis[6]

Coke

Since the beginning of manufacturing of metallurgical coke in the United States, which dates from about 1859, Pennsylvania has maintained supremacy in coke production. Available statistics for the year 1880 show an output of 3,338,300 short tons, which was nearly trebled by the end of the succeeding 10 years. From this time on the increase was steady, though not rapid, and in 1922 the total production was 13,991,892 tons, which is approximately 37 per cent of the total coke production of the United States.

The main reason for the rapid development of the coke industry in Pennsylvania lies in the abundance of coals particularly adapted to beehive coking, for which purpose the Pittsburgh bed in the Connellsville district has long been looked upon as standard. At first practically all metallurgical coke was made in beehive ovens, the only exception being the short-lived and wasteful method of coking in piles; by-product ovens did not make their appearance until after 1893. The suitability of a beehive coking coal cannot be accurately predicted from its chemical analysis, but it can be said, perhaps, that the volatile matter should be about 32 per cent, and that the oxygen content should not be more than 10 per cent or less than 4 per cent. The sulphur and phosphorus content should be small—not over 1.25 per cent sulphur and under 0.02 per cent phosphorus—and the ash content should not be over 7 per cent. The Pittsburgh bed at Connellsville fills these requirements well, as may be seen from the following representative analysis:

Analysis of coal from Pittsburgh bed

Moisture	1.70
Volatile matter	31.10
Fixed carbon	59.80
Ash	7.40
Sulphur	0.85
B. t. u.	13,990

[6] Fuels Chemist, U. S. Bureau of Mines.

This bed was early developed for manufacture of metallurgical coke because it is low in impurities, and may be used without preparation. Other coals well adapted to beehive coking are those from the Upper and Lower Freeport and Upper and Lower Kittanning beds. Still other coals may be used; in fact, practically all the bituminous coal of Pennsylvania may be coked when the method is extended to modern by-product ovens, and includes preparation such as by washing. By-product ovens are considerably more adaptable than beehive ovens; they lend themselves better to making a product of suitable average volatile matter from mixed coal. Pennsylvania is also the leading State in the development of by-product coking, having 3360 ovens, or more than three times as many oven of this kind in operation as in any other State. In so far as the content of volatile matter is concerned, all Pennsylvania bituminous coals may be classed as by-product coals, because if volatile matter is too low or too high a suitable coal for mixing will always be found within easy shipping distance.

Impurities are another factor to be considered in determining the suitability of a coal for by-product purposes. Some coal may be purified, as by washing, and in this way many impure coals may be rendered suitable for by-product coking. The question is entirely that of competition—that is, as to whether the coal will bear the expense of treatment in competition with other coals of the State which require none. In the early history of the industry excellent coking coals requiring no purification were abundant, and hence there were no washeries in Pennsylvania. The time is approaching, however, when the best coals will be exhausted and coal washing will be necessary. According to present by-products standards, a coal having the following chemical qualifications is considered suitable for the process:

Qualifications of by-product coal

Volatile matter	17 to 18 (this gage contemplates mixing)
Ash	4 to 8
Sulphur	not over 1.5
Phosphorus	under 0.02

The coal beds suitable for beehive coking are also suitable for by-product coking; other beds are doubtless suitable for the latter method, but these mentioned are of proven merit. It seems certain that, as requirements for metallurgical coke increase, by-product coking is destined to rapid development.

Gas Coal

The same coals that are listed as by-product coals are also suitable for gas making; and as for the former purpose a chemical analysis is not entirely reliable for evaluating a gas coal. In general, however, a good gas coal will analyze as follows:

Analysis of gas coal

Volatile matter	32 - 37
Ash	Not over 6 - 8
Sulphur	Under 1.25
Coke yield	65 to 70
Gas yield, cu. ft. per ton	10,000 - 12,000

A gas coal must yield a high proportion of its volatile matter in the form of gas; also it must yield a coke which is low enough in ash and strong enough to be marketable. Another desideratum is that the coal yields its gas quickly, as this makes for rapid operation and hence greater capacity of carbonization apparatus. As with by-products coking, the quality of the volatile matter of a coal as well as quantity determines its suitability for gas making. Attempts have been made to define the quality by the available hydrogen content and by the heating value of volatile matter, but neither of these criteria has become generally accepted.

ANALYSES OF MINE SAMPLES

By A. C. Fieldner,[7] H. M. Cooper,[8] and F. D. Osgood[9]

The analyses in the tables are arranged geographically with respect to county and towns, and are grouped as follows:

1. The proximate analysis—moisture, volatile matter, fixed carbon, and ash.
2. The ultimate analysis—carbon, hydrogen, nitrogen, oxygen, sulphur, and ash.
3. The calorific value of heat of combustion.
4. The softening temperature of ash, when such determinations were made.

Ultimate analyses are given in three conditions—namely, (1) as received; (2) moisture free; and (3) moisture and ash free. Proximate analyses and heating values are given generally in one condition—namely, as received; some are in two conditions, as received and moisture free.

[7] Supervising fuels chemist, Pittsburgh Experiment Station, Bureau of Mines.
[8] Chemist, Pittsburgh Experiment Station.
[9] Assistant chemist, Pittsburgh Experiment Station.

The as-received condition represents the sample as received at the laboratory, while the moisture-free condition represents the composition and heating value of the dry coal. The moisture and ash-free condition represents approximately the composition and calorific value of the dry combustible matter.

The analyses are given to the nearest 0.1 per cent, and the B. t. u. to the nearest 10, although the laboratory determinations are made to the nearest 0.01 per cent and the nearest unit B. t. u.

Sources of Information

The tables give the chemical analyses of coal from mines and prospects collected at various times in the course of systematic surveys of the coal resources of Pennsylvania. As the various coal beds are widely distributed, many local names have been given which later have been correlated as the same coal. In such cases the name of the bed published in these tables has been changed to correspond to the latest identification of the coal bed. For instance: the bed locally known in various regions as Barnett, Fulton, B, Miller, or Bloss bed, is in reality the same as the Lower Kittanning, and is so recorded; likewise the D or Moshannon is recorded as the Lower Freeport bed, and the E or Lemon as the Upper Freeport bed.

The analyses have been taken from previous publications of the Bureau of Mines—namely, Bulletins 22, 85, 123, and 193, to which are added many new analyses up to January 1, 1923, which are here published for the first time. The methods[10] of sampling and analysis used are those employed by the U. S. Geological Survey and Bureau of Mines. Nearly all of the analyses in the table which are published for the first time, were collected by the geologists of the Pennsylvania Topographic and Geologic Survey in a recent survey of the coal resources of this State. The majority of the analyses credited to Bulletin 22 were made under the direction of the U. S. Geological Survey at the Coal Testing Plant at St. Louis, published in various reports and later incorporated in Bulletin 22. All other analyses were made in the Coal Testing Laboratories of the Bureau of Mines at Pittsburgh, Pa., and at Washington, D. C.

Fusibility of Ash

In general, the softening temperature of coal ash from the coals of the United States[11] ranges from 1900° to 3100° F. For convenience, the order of fusibility may be expressed by subdividing this range of softening temperature into three groups as follows:

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[10] Stanton, F. M., and Fieldner, A. C., Methods of analyzing coal and coke: U. S. Bureau of Mines, Tech. Paper 8, 42 pp., 1913.
[11] Selvig, W. A., and Fieldner, A. C., Fusibility of ash from coals in the United States. U. S. Bureau of Mines, Bull. 209, 119 pp., 1922.

Class I. Refractory ash, softening above 2600° F.

Class II. Ash of medium fusibility, softening between 2200 and 2600° F.

Class III. Easily fusible ash, softening below 2200° F.

An ash cone fuses down to a spherical lump when heated in a test furnace with slightly reducing atmosphere. The softening temperature is the temperature at which a cone of ash, when heated in the test furnace with a slightly reducing atmosphere, has fused down to a spherical lump.

The Bureau of Mines has determined softening temperatures of ash in a great number of coals of the United States. The ash in Pennsylvania coals has a wide range of fusibility, from easily fusible to very refractory. The ash of the bituminous coals of western Pennsylvania fuses at medium temperatures, with few exceptions. The ash from coals of the Monongahela group, comprising the Waynesburg, Sewickley, Redstone, and Pittsburgh beds, is generally found in the medium fusible Class II (2200 to 2600° F.) The ash in the Sewickley bed is easily fusible below 2200° F.; in both the Redstone and Waynesburg beds local samples, usually in Allegheny and Somerset counties, are found in refractory Class I. The ash of coals in the Conemaugh group, represented by the Bakerstown and Mahoning beds, ranges in softening temperatures from 2050 to 2400° F. The majority of ash determinations are between 2150° and 2450° F., or upper Class III and lower Class II.

A large part of the coal produced in western Pennsylvania comes from beds in the Allegheny group (the Upper and Lower Freeport, the Upper, Middle, and Lower Kittanning, the Clarion, and the Brookville beds).

In the coal beds of Somerset, Cambria, Clearfield, Centre, and Tioga counties, where the coals are semi-bituminous, the ash is usually in refractory Class I. The actual temperature observed for those individual samples on which tests were made will be found in column 17 of the following table.

Analyses of mine samples

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ALLEGHENY COUNTY.																		
Bakerstown, 1 mile south of; Fisher mine, Bakerstown bed (upper bench).	83,120	B	1	2.2	34.1	42.5	21.2	3.4	----	----	----	----	1.2	6,256	11,260	2.240	----	----
			2	----	34.8	43.5	21.7	3.4	----	----	----	----	----	6,394	11,510	----	----	----
Bruceton; Bertha mine, Pittsburgh bed (face of 1 entry, 1 butt entry, 5000 feet from mine mouth).	2,080	A	1	3.7	34.0	56.8	5.5	1.4	----	----	----	----	1.8	7,706	13,870	----	22	----
			2	----	35.3	59.0	5.7	1.4	----	----	----	----	----	8,001	14,400	----	----	----
Same (face of 3 entry, 5000 feet from mine mouth)	2,081	A	1	4.1	34.4	56.2	5.3	1.3	----	----	----	----	2.2	----	----	----	22	----
1 mile south of; Experimental mine, Pittsburgh bed, (rib of 1 crosscut, 200 feet from mouth of aircourse).	11,983	A	1	3.1	35.2	55.9	5.8	1.2	----	----	----	----	1.3	----	----	----	85	----
Same (rib near face of aircourse, 390 feet from mouth of aircourse).	11,984	A	1	2.7	35.4	55.7	6.2	1.5	----	----	----	----	1.0	----	----	----	85	----
Same (face of main entry, 345 feet from mouth of entry).	11,985	A	1	2.7	35.5	55.1	6.7	1.5	----	----	----	----	1.0	----	----	2,370	85	----
Same (composite of samples 11,983 to 11,985 inclusive).	11,986	A	1	2.7	36.0	55.0	6.3	1.4	5.3	76.8	1.5	8.7	1.1	7,678	13,820	----	85	----
			2	----	37.0	56.6	6.4	1.4	5.1	79.0	1.5	6.6	----	7,889	14,200	----	----	----
			3	----	39.6	60.4	----	1.5	5.5	84.4	1.6	7.0	----	8,433	15,180	----	----	----
Same (in aircourse, 75 feet from outcrop at mouth of aircourse).	12,251	A	1	2.9	35.2	57.5	4.4	1.2	5.4	78.5	1.6	8.9	0.9	7,800	14,040	----	85	----
			2	----	36.3	59.2	4.5	1.2	5.2	80.8	1.6	6.7	----	8,023	14,450	----	----	----
			3	----	38.0	62.0	----	1.2	5.4	84.6	1.7	7.1	----	8,406	15,130	----	----	----
Same (left side of aircourse, 150 feet from mouth of aircourse).	12,262	A	1	3.3	35.2	56.9	4.6	1.4	5.4	77.5	1.5	9.6	1.4	7,767	13,980	----	85	----
			2	----	36.4	58.9	4.8	1.5	5.2	80.2	1.6	6.9	----	8,033	14,460	----	----	----
			3	----	38.2	61.8	----	1.5	5.4	84.2	1.6	7.3	----	8,433	15,180	----	----	----
Same (left side of aircourse, 430 feet from mouth of aircourse).	12,264	A	1	2.9	35.1	55.8	6.2	1.5	5.3	77.0	1.5	8.5	0.9	7,644	13,760	----	85	----
			2	----	36.2	57.4	6.4	1.6	5.2	79.3	1.6	5.9	----	7,867	14,160	----	----	----
			3	----	38.6	61.4	----	1.7	5.5	84.7	1.7	6.4	----	8,406	15,130	----	----	----
Same (right side of main entry, 680 feet inby outcrop).	12,557	A	1	3.3	36.1	53.4	7.2	1.2	5.4	74.6	1.5	10.1	1.3	7,511	13,520	----	85	----
			2	----	37.3	55.3	7.4	1.2	5.2	77.1	1.6	7.5	----	7,767	13,980	----	----	----
			3	----	40.3	59.7	----	1.3	5.6	83.3	1.7	8.1	----	8,383	15,090	----	----	----
Same (right side of main entry, 530 feet inby outcrop).	12,569	A	1	3.3	36.8	54.2	5.7	1.0	5.3	76.9	1.5	9.6	1.3	7,633	13,740	----	85	----
			2	----	38.1	56.0	5.9	1.1	5.1	79.6	1.6	6.7	----	7,900	14,220	----	----	----
			3	----	40.5	59.5	----	1.1	5.4	84.5	1.7	7.2	----	8,389	15,100	----	----	----
Same (right side of main entry, 580 feet inby outcrop).	12,572	A	1	2.9	36.2	55.2	5.7	1.2	5.5	76.8	1.5	9.3	0.8	7,614	13,760	----	85	----
			2	----	37.3	56.8	5.9	1.2	5.3	79.2	1.6	6.8	----	7,878	14,180	----	----	----
			3	----	39.6	60.4	----	1.3	5.6	84.1	1.7	7.4	----	8,372	15,070	----	----	----

Same (right side of main entry, 6.0 feet inby outcrop).	12,577	A	1	3.2	34.6	53.7	8.5	1.1	5.2	74.2	1.5	9.5	1.3	7,378	13,280	2,510	85	----
			2	----	35.8	55.5	8.7	1.1	5.0	76.7	1.5	7.0	----	7,6[illegible]2	13,7[illegible]0	----	----	----
			3	----	39.2	60.8	----	1.2	5.5	84.1	1.6	7.6	----	8,356	15,040	----	----	----
Same (in crosscut, main entry, station E-1250, 3 feet from main entry).	14,797	A	1	3.3	35.5	54.5	6.6	1.2	----	----	----	----	1.9	----	----	----	85	----
Same (in main entry, at station E-1270).	14,798	A	1	3.3	35.8	55.0	5.0	1.3	----	----	----	----	1.8	----	----	----	85	----
Same (1 cut-through, between rooms 1 and 2, 1 east butt entry, 8 feet from east rib of room 1, 1000 feet from mine mouth, center section of bed).	18,843	A	1	2.8	34.4	54.0	8.8	0.9	5.2	74.5	1.5	9.1	1.3	7,439	13,390	----	123	----
			2	----	35.4	55.5	9.1	0.9	5.0	76.7	1.5	6.8	----	7,661	13,790	----	----	----
			3	----	39.0	61.0	----	1.0	5.5	84.3	1.7	7.5	----	8,417	15,150	----	----	----
Same (bottom of section).	18,845	A	1	3.1	35.7	53.6	7.6	2.0	5.2	75.0	1.4	8.8	1.5	7,450	13,410	----	123	----
			2	----	36.8	55.4	7.8	2.0	5.0	77.4	1.5	6.3	----	7,689	13,840	----	----	----
			3	----	39.9	60.1	----	2.2	5.4	84.0	1.6	6.8	----	8,339	15,010	----	----	----
Same (top of section).	18,847	A	1	2.0	38.6	54.7	4.7	1.7	5.4	78.6	1.6	8.0	0.4	7,867	14,160	----	123	----
			2	----	39.3	55.9	4.8	1.7	5.3	80.2	1.6	6.4	----	8,0[illegible]8	14,4[illegible]0	----	----	----
			3	----	41.3	58.7	----	1.8	5.5	84.3	1.7	6.7	----	8,439	15,190	----	----	----
Same (face of 2 room, 1 butt entry).	22,618	A	1	2.7	37.0	54.2	6.1	1.0	5.4	77.6	1.6	8.3	0.6	7,683	13,830	2,[illegible]80	123	----
			2	----	38.0	55.7	6.3	1.0	5.3	79.7	1.6	6.1	----	7,900	14,220	----	----	----
			3	----	40.6	59.4	----	1.1	5.6	85.1	1.7	6.5	----	8,428	15,1[illegible]0	----	----	----
Same (inby face of 2 crosscut between rooms 5 and 6).	80,530	A	1	3.0	36.2	54.7	6.1	1.3	5.4	76.0	1.4	9.9	1.8	7,567	13,620	----	----	----
			2	----	37.4	56.4	6.3	1.3	5.2	78.4	1.4	7.4	----	7,800	14,040	----	----	----
			3	----	39.9	60.1	----	1.4	5.6	83.6	1.5	7.9	----	8,322	14,980	----	----	----
Cheswick; Harwick mine, Upper Freeport bed.	32,984	A	1	2.1	34.4	52.8	10.7	1.3	5.2	74.1	1.4	7.3	.8	7,317	13,170	2,170	----	----
			2	----	35.1	54.0	10.9	1.3	5.1	75.7	1.4	5.6	----	7,472	13,450	----	----	----
			3	----	39.4	60.6	----	1.5	5.7	85.0	1.6	6.2	----	8,394	15,110	----	----	----
Clinton; Country Bank, Pittsburgh bed.	1,048	B	1	3.4	35.6	47.4	13.6	1.4	----	----	----	----	----	----	----	----	22	----
Creighton; Creighton mine, Upper Freeport bed (4800 feet northwest of mine mouth).	3,437	A	1	2.5	34.0	54.5	9.0	2.2	----	----	----	----	1.0	7,422	13,360	----	22	----
Same (5500 feet northwest of mine mouth).	3,438	A	1	2.9	34.0	55.6	7.5	1.9	----	----	----	----	1.3	----	----	----	22	----
Same (Upper Freeport bed rib of 1 room 100 feet from chute, between 10 entry and line air-course).	26,932	A	1	3.2	35.2	54.2	7.4	0.7	----	----	----	----	2.0	7,589	13,660	2,960	193	----
Same (rib of 1 crosscut, 10 room, 15 entry)	26,933	A	1	2.7	33.1	52.2	12.0	1.0	----	----	----	----	1.5	7,217	12,990	2,620	193	----
Same (face of 2 room, 150 feet from 21 entry).	26,990	A	1	2.8	33.2	53.6	10.4	1.2	----	----	----	----	1.5	7,322	13,180	2,410	193	----
Same (face of 1 room, 10½ entry, 20 feet inby 1 crosscut).	26,991	A	1	2.8	34.2	52.0	11.0	1.7	----	----	----	----	1.8	7,311	13,160	2,360	193	----
Same (composite of samples 26932, 26933, 26990 and 26991).	26,992	A	1	2.9	33.8	53.1	10.2	1.1	5.3	73.8	1.5	8.1	1.7	7,314	13,220	----	193	----
			2	----	34.8	54.7	10.5	1.2	5.1	75.9	1.5	5.7	----	7,561	13,610	----	----	----
			3	----	38.9	61.1	----	1.3	5.7	84.9	1.7	6.4	----	8,441	15,200	----	----	----
Same (rib of 5 room, 19 entry, main entry).	26,934	A	1	3.0	32.7	53.2	11.1	1.5	----	----	----	----	1.7	7,261	13,070	2,430	193	----
Same (C face, 300 feet in by old right entry, cannel coal).	27,088	A	1	.9	28.9	35.0	35.2	1.0	4.0	54.1	1.1	4.6	.2	5,429	9,790	2,710	193	----
			2	----	29.2	35.3	35.5	1.0	4.0	54.5	1.1	3.9	----	5,483	9,870	----	----	----
			3	----	45.3	54.7	----	1.5	6.1	84.6	1.7	6.1	----	8,500	15,300	----	----	----
Hite mine, Upper Freeport bed (face of 17 room, 1 butt entry, 8,000 feet west of mine mouth).	11,130	A	1	2.7	34.8	56.0	6.5	1.0	----	----	----	----	1.2	----	----	2,520	85	----

* Laboratory numbers with prefix W represent samples analyzed in the Washington laboratory of the U. S. Bureau of Mines; all others were analyzed at the Pittsburgh laboratory.

† A, mine samples collected by an engineer of the U. S. Bureau of Mines; B mine samples collected by a geologist of either the U. S. Geological Survey or the Pennsylvania Topographic and Geologic Survey.

‡ 1, sample "as received" at the laboratory; 2, dried at a temperature of 105° C.; 3, moisture and ash free.

§ Figures in column 17 are the temperatures at which the cone of coal ash has fused down to a spherical lump when heated in the furnace in a slightly reducing atmosphere.

¶ Figures in column 18 represent the U. S. Bureau of Mines bulletins in which may be found the description of the section of the bed from which the sample was taken. Figures in column 19 represent the page of this bulletin where the same information may be found about the newer samples.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ALLEGHENY COUNTY—Continued.																		
Same (face of 18 room, 3 butt entry, 9,000 feet from mine mouth).	11,132	A	1	2.7	34.4	56.3	6.6	1.0	-----	-----	-----	-----	1.2	-----	-----	2,410	85	-----
Same (grab sample of cannel coal, at inter-section of line entry, and 1 main entry).	11,133	A	1	1.1	26.2	36.4	36.3	1.6	-----	-----	-----	-----	.4	-----	-----	2,590	85	-----
Curtisville; Ford Collieries No. 1 mine, Upper Freeport bed (face of 11 rib, 17 left entry, south entry, upper bench).	83,114	B	1	2.1	36.0	55.3	6.7	1.7	-----	-----	-----	-----	.9	7,072	13,810	2,390	-----	129
			2	-----	36.7	56.5	6.8	1.8	-----	-----	-----	-----	-----	7,833	14,100	-----	-----	-----
Same (face of 11 rib, 17 left south entry, lower bench).	83,115	B	1	2.2	35.7	57.0	5.1	1.1	-----	-----	-----	-----	.7	7,767	13,980	2,280	-----	129
			2	-----	36.4	58.3	5.3	1.1	-----	-----	-----	-----	-----	7,939	14,290	-----	-----	-----
Same (between 3 and 4 entries, 4 south face entry, cannel coal—lower bench).	83,116	B	1	.8	34.1	44.3	20.8	.8	-----	-----	-----	-----	.2	6,677	12,020	2,800	-----	129
			2	-----	34.3	44.7	21.0	.8	-----	-----	-----	-----	-----	6,727	12,110	-----	-----	-----
East Pittsburgh, 1 mile south of; Crestas wagon mine, Redstone bed (face of 1 right entry, 400 feet southwest of entrance).	85,902	B	1	2.1	34.2	52.6	11.1	2.6	-----	-----	-----	-----	1.1	7,239	13,030	2,450	-----	129
Same (left rib of middle entry, 300 feet south of entrance).	85,903	B	1	2.6	34.3	52.0	11.1	1.9	-----	-----	-----	-----	1.4	7,117	12,810	2,510	-----	129
Same (composite of samples 85,902 and 85,903).	85,904	B	1	2.4	34.8	51.7	11.1	2.3	5.2	71.8	.7	8.9	1.2	7,183	12,930	-----	-----	-----
			2	-----	35.6	53.0	11.4	2.3	5.1	73.5	.7	7.0	-----	7,356	13,240	-----	-----	-----
			3	-----	40.2	59.8	-----	2.6	5.8	83.0	.8	7.8	-----	8,294	14.930	-----	-----	-----
Elizabeth; Patterson No. 2 mine, Pittsburgh bed (rib of 11 face entry, 93 feet in by 14 butt entry).	20,032	A	1	2.5	35.4	56.7	5.4	.8	-----	-----	-----	-----	1.4	7.739	13,930	2,580	123	-----
Same (pillar of 9 butt entry, near 11 face entry).	20,034	A	1	2.5	33.9	57.2	6.4	.8	5.3	78.1	1.6	7.8	1.5	7,644	13 760	2,300	123	-----
			2	-----	34.7	58.8	6.5	.8	5.2	80.1	1.6	5.8	-----	7.844	14,120	-----	-----	-----
			3	-----	37.2	62.8	-----	.9	5.5	85.7	1.8	6.1	-----	8.394	15,110	-----	-----	-----
Glenshaw: W. H. Porter bank, Upper Freeport bed (face of 1 left side entry).	83,124	B	1	2.4	36.5	53.8	7.2	2.3	-----	-----	-----	-----	1.4	7 539	13,570	2,130	-----	130
			2	-----	37.4	55.2	7.4	2.3	-----	-----	-----	-----	-----	7,728	13,910	-----	-----	-----
Harmarville; Harmar mine, Upper Freeport bed, (face of dump entry).	83,123	B	1	2.4	33.8	55.8	8 0	1.5	-----	-----	-----	-----	1.1	7.567	13,610	2,160	-----	130
			2	-----	34.6	57.2	8.2	1.6	-----	-----	-----	-----	-----	7,750	13.950	-----	-----	-----
Indianola; Inland Collieries Co. mine, Upper Freeport bed (face of 3 main north entry, 5,275 feet from shaft, upper bench).	83,121	B	1	1.4	36 4	54.6	7.6	1.4	-----	-----	-----	-----	.6	7,661	13,790	2,280	-----	130
			2	-----	36.9	55.4	7.7	1.4	-----	-----	-----	-----	-----	7,772	13,990	-----	-----	-----

Same (face of 3 main north entry, lower bench).	83,122	B	1	2.7	33.3	57.1	6.9	.5	----	----	----	----	1.6	7,622	13,720	2,510	----	130
			2	----	34.2	58.7	7.1	.5	----	----	----	----	----	7,838	14,090	----	----	----
Lincoln Place, ½ mile southeast of; Koebler mine, Pittsburgh bed (face of main entry, 400 feet northwest of mine mouth).	85,960	B	1	4.2	33.9	55.9	6.0	1.2	----	----	----	----	2.5	7,533	13,560	2,510	----	131
Same (face of 3 right entry, 300 feet northwest of mine mouth).	85,961	B	1	3.7	35.1	55.3	5.9	1.7	----	----	----	----	2.3	7,528	13,550	2,280	----	----
Same (composite of samples 85,960 and 85,961).	85,962	B	1	3.9	34.1	56.0	6.0	1.4	5.5	75.6	1.4	10.1	2.4	7,506	13,510	----	----	----
			2	----	35.5	58.3	6.2	1.5	5.2	78.7	1.5	6.9	----	7,817	14,070	----	----	----
			3	----	37.9	62.1	----	1.6	5.6	84.0	1.6	7.2	----	8,333	15,000	----	----	----
Logans Ferry, ¾ mile southeast of; Edward Farneth mine, Pittsburgh bed (face of left side entry, 250 feet from opening).	83,117	B	1	4.3	34.1	53.9	7.7	1.3	----	----	----	----	2.1	7,111	12,800	2,510	----	131
			2	----	35.6	56.4	8.0	1.3	----	----	----	----	----	7,434	13,380	----	----	----
McKeesport, 4 miles east of; Union Valley No. 2 mine, Pittsburgh bed (face of 2 room, 5 left butt entry).	82,396	B	1	3.0	33.1	56.0	7.9	1.4	----	----	----	----	2.1	7,483	13,470	2,800	----	131
Same (rib of main entry, near face).	82,397	B	1	3.3	32.7	56.6	7.4	1.3	----	----	----	----	2.4	7,528	13,550	2,800	----	----
Same (composite of samples 82396 and 82397).	82,398	B	1	3.2	32.8	56.5	7.5	1.4	5.3	75.1	1.5	9.2	2.3	7,494	13,490	----	----	----
			2	----	33.9	58.3	7.8	1.5	5.1	77.6	1.5	6.5	----	7,774	13,940	----	----	----
			3	----	36.7	63.3	----	1.6	5.6	84.1	1.7	7.0	----	8,394	15,110	----	----	----
Natrona; Natrona No. 1 mine, Upper Freeport bed (face of 206 room, 14 west entry).	85,869	B	1	2.3	35.1	54.4	8.2	1.8	----	----	----	----	1.5	7,467	13,440	2,200	----	132
Same (face of 106 room, 16 west entry).	85,870	B	1	2.2	35.8	55.8	6.2	1.3	----	----	----	----	1.3	7,650	13,770	2,240	----	----
Same (face of north face heading, 3½ miles from mine mouth).	85,871	B	1	2.2	35.9	55.0	6.9	.8	----	----	----	----	1.4	7,667	13,800	2,180	----	----
Same (composite of samples 85,869 to 85,871 inclusive).	85,872	B	1	2.2	35.8	54.9	7.1	1.3	5.4	76.5	1.5	8.2	1.4	7,589	13,660	----	----	----
			2	----	36.6	56.1	7.3	1.3	5.4	78.2	1.6	6.2	----	7,761	13,970	----	----	----
			3	----	39.5	60.5	----	1.4	5.7	84.3	1.7	6.9	----	8,372	15,070	----	----	----
North Bessemer, New Field By-Product No. 1 mine, Upper Freeport bed (bottom bench), (face of 8 room, 4 west entry).	32,255	A	1	4.9	32.2	57.0	5.9	0.5	----	----	----	----	3.2	7,806	14,050	2,440	----	132
Same (Upper Freeport bed, top bench, face of 8 room, 4 west entry).	32,256	A	1	2.6	35.9	52.8	8.8	1.7	----	----	----	----	1.5	7,539	13,570	2,180	----	----
Same (composite of samples 32,255 and 32,256).	32,257	A	1	3.7	33.9	55.1	7.4	1.1	5.3	76.1	1.5	8.6	2.3	7,522	13,540	----	----	----
			2	----	35.2	57.2	7.7	1.1	5.0	79.1	1.6	5.5	----	7,811	14,060	----	----	----
			3	----	38.1	61.9	----	1.2	5.5	85.6	1.7	6.0	----	8,456	15,220	----	----	----
Same (on rib, 1 east entry, 150 feet from face).	32,258	A	1	2.1	37.1	54.1	6.7	2.9	5.4	77.3	1.5	6.2	0.7	7,733	13,920	2,010	----	----
			2	----	37.9	55.3	6.8	3.0	5.3	79.0	1.5	4.4	----	7,900	14,220	----	----	----
			3	----	40.7	59.3	----	3.2	5.7	84.8	1.6	4.7	----	8,478	15,260	----	----	----
Same (25 feet from face of 6 left entry).	32,259	A	1	2.3	36.2	53.0	8.5	2.5	----	----	----	----	1.0	7,567	13,620	2,150	----	----
			2	----	37.1	54.2	8.7	2.5	----	----	----	----	----	7,744	13,940	----	----	----
Same (on rib 1 east entry, 150 feet from face, bone coal)	32,260	A	1	1.6	28.8	40.9	28.6	1.8	----	----	----	----	0.5	5,767	10,380	2,850	----	----
North Bessemer; New Fields By-Product No. 1 mine, Upper Freeport bed (face of 2 right entry, south of left entry, upper bench).	83,118	B	1	1.4	35.1	54.1	9.4	2.2	----	----	----	----	.8	7,556	13,600	2,130	----	133
			2	----	35.6	54.9	9.5	2.3	----	----	----	----	----	7,661	13,790	----	----	----
Same (lower bench).	83,119	B	1	2.0	35.1	56.9	6.1	.9	----	----	----	----	.9	7,761	13,970	2,620	----	----
			2	----	35.8	58.0	6.2	.9	----	----	----	----	----	7,917	14,250	----	----	----
Oak Station, south of Pittsburgh; Oak mine, Pittsburgh bed (face of 10 room, 13 left entry, 5,300 feet north of mine mouth).	10,845	A	1	3.5	35.2	55.4	5.9	1.2	5.4	75.7	1.5	10.3	1.7	7,611	13,700	2,430	85	----
			2	----	36.4	57.5	6.1	1.2	5.2	78.5	1.5	7.5	----	7,883	14,190	----	----	----
			3	----	38.8	61.2	----	1.3	5.6	83.6	1.6	7.9	----	8,400	15,120	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ALLEGHENY COUNTY—Continued.																		
Peterson Station; Peterson mine, Upper Freeport bed (left rib of manway, 800 feet northwest of entrance).	85,841	B	1	2.4	37.3	53.5	6.8	2.8	5.5	75.8	1.5	7.6	1.5	7,617	13,710	2,200	-----	133
			2	-----	38.2	54.8	7.0	2.9	5.4	77.7	1.5	5.5	-----	7,806	14,050	-----	-----	-----
			3	-----	41.1	58.9	-----	3.1	5.8	83.5	1.7	5.9	-----	8,394	15,110	-----	-----	-----
Pittsburgh, 6 miles east of it; at end of Lincoln car line, Smith mine, Pittsburgh bed (100 feet to right of main heading 500 feet southwest of mine mouth).	85,816	B	1	3.8	34.7	55.3	6.2	1.1	-----	-----	-----	-----	2.2	7,444	13,400	2,620	-----	134
Same (30 feet to right of main heading, 400 feet south of mine mouth).	85,817	B	1	4.3	34.4	55.3	6.0	1.0	-----	-----	-----	-----	2.7	7,394	13,310	2,570	-----	-----
Same (composite of samples 85816 and 85817)	85,818	B	1	4.0	34.6	55.3	6.1	1.1	5.6	74.9	1.6	10.7	2.5	7,411	13,340	-----	-----	-----
			2	-----	36.1	57.6	6.3	1.1	5.3	78.1	1.6	7.6	-----	7,722	13,900	-----	-----	-----
			3	-----	38.5	61.5	-----	1.2	5.7	83.4	1.7	8.0	-----	8,244	14,840	-----	-----	-----
Scott Haven; Ocean No. 2 mine, Pittsburgh bed (face of 19 room, 14 south entry, 1 face entry).	6,627	A	1	2.6	32.7	59.4	5.3	.8	5.4	78.2	1.5	8.8	1.4	7,828	14,090	-----	22	134
			2	-----	33.5	61.0	5.5	.8	5.2	80.3	1.5	6.7	-----	8,033	14,460	-----	-----	-----
			3	-----	35.5	64.5	-----	.8	5.5	84.9	1.6	7.2	-----	8,500	15,300	-----	-----	-----
Same (face of 19 room, 10 north entry, 6 face entry).	6,656	A	1	2.6	33.5	58.7	5.2	.8	5.5	77.6	1.3	9.6	1.4	7,861	14,150	-----	22	-----
			2	-----	34.4	60.3	5.3	.8	5.4	79.7	1.3	7.5	-----	8,072	14,530	-----	-----	-----
			3	-----	36.3	63.7	-----	.9	5.7	84.2	1.4	7.8	-----	8,528	15,350	-----	-----	-----
¼ mile south of; Scott Haven mine, Redstone bed (face of 2 east entry).	82,399	B	1	2.6	34.1	51.7	11.6	2.0	-----	-----	-----	-----	1.9	1,133	12,840	2,420	-----	-----
Same (face of 7 room, 3 entry)	82,400	B	1	2.6	34.8	52.7	9.9	1.5	-----	-----	-----	-----	1.9	7,283	13,110	2,570	-----	-----
Same (face of 4 butt entry)	82,401	B	1	2.7	32.9	53.0	11.1	1.8	-----	-----	-----	-----	2.1	7,194	12,950	2,390	-----	-----
Same (composite of samples 82399 to 82401 inclusive).	82,402	B	1	2.6	34.0	52.6	10.8	1.8	5.1	72.0	1.5	8.8	1.9	7,222	13,000	-----	-----	-----
			2	-----	35.0	53.9	11.1	1.8	5.0	73.9	1.5	6.7	-----	7,422	13,360	-----	-----	-----
			3	-----	39.3	60.7	-----	2.0	5.6	83.2	1.7	7.5	-----	8,350	15,030	-----	-----	-----
Springdale, ½ mile northeast of; Springdale mine, Upper Freeport bed (face of 2 main east entry).	85,873	B	1	2.4	35.0	55.1	7.5	2.0	-----	-----	-----	-----	1.6	7,528	13,550	2,140	-----	134
Same (face of 7 east entry)	85.874	B	1	2.8	34.8	55.9	6.5	.6	-----	-----	-----	-----	2.1	7,672	13,810	2,280	-----	-----
Same (face of main south entry, 3 main east entry)	85,875	B	1	1.8	35.8	56.0	6.4	.7	-----	-----	-----	-----	1.2	7,750	13,950	2,240	-----	-----
Same (face of 3 right entry, 5 left entry)	85,876	B	1	3.4	34.2	54.8	7.6	.8	-----	-----	-----	-----	2.7	7,528	13,550	2,390	-----	-----

Same (composite of samples 85873 to 85876 inclusive).	85,877	B	1	2.6	35.2	55.2	7.0	1.0	5.6	76.5	1.5	8.4	1.9	7,600	13,680	-----	-----	-----
			2	-----	36.2	56.6	7.2	1.0	5.4	78.6	1.6	6.2	-----	7,806	14,050	-----	-----	-----
			3	-----	39.0	61.0	-----	1.1	5.8	84.7	1.7	6.7	-----	8,411	15,140	-----	-----	-----
Turtle Creek, Herold & Bowers mine, Pittsburgh bed (face of 1 room, 1 entry).	82,221	B	1	2.8	36.0	54.1	7.2	-----	-----	-----	-----	-----	1.6	6,761	12,170	-----	-----	135
Same (face of room, 2 entry)	82,222	B	1	3.0	34.6	55.0	7.4	1.3	-----	-----	-----	-----	1.9	7,483	13,470	2,850	-----	-----
Same (composite of samples 82221 and 82222)	82,223	B	1	2.9	34.9	54.8	7.3	1.2	5.4	75.4	1.4	9.3	1.8	7,511	13,520	-----	-----	-----
			2	-----	36.0	56.5	7.5	1.2	5.2	77.7	1.5	6.9	-----	7,733	13,920	-----	-----	-----
			3	-----	38.9	61.1	-----	1.3	5.6	84.0	1.6	7.5	-----	8,367	15,060	-----	-----	-----
Universal, 1 mile south of: Moranina mine, Pittsburgh bed (face of room, 100 feet to left of main entry, 800 feet east of entrance).	85,899	B	1	3.3	34.9	54.4	7.4	1.3	-----	-----	-----	-----	1.9	7,439	13,390	2,340	-----	135
Same (face of room, 100 feet to left of main entry, 500 feet east of entrance).	85,900	B	1	2.9	34.1	55.5	7.5	.9	-----	-----	-----	-----	1.5	7,522	13,540	2,740	-----	-----
Same (composite of samples 85899 and 85900)	85,901	B	1	3.0	34.9	54.7	7.4	1.1	5.3	75.5	1.0	9.7	1.7	7,494	13,490	-----	-----	-----
			2	-----	36.0	56.3	7.7	1.1	5.1	77.9	1.0	7.2	-----	7,728	13,910	-----	-----	-----
			3	-----	38.9	61.1	-----	1.2	5.5	84.3	1.1	7.9	-----	8,367	15,060	-----	-----	-----
West Elizabeth; Rowland custom bank, Redstone bed (face of 1 left face entry, 1 right butt heading, main entry, 400 feet northwest of entrance).	85,963	B	1	3.9	31.5	54.3	10.3	1.2	-----	-----	-----	-----	2.1	7,078	12,740	2,620	-----	136
Same (face of 2 left face entry, 1 right butt heading, main entry, 500 feet northwest of entrance).	85,964	B	1	4.8	31.7	55.1	8.4	1.0	-----	-----	-----	-----	2.5	7,111	12,800	2,850	-----	-----
Same (composite of samples 85963 and 85964).	85,965	B	1	4.4	32.0	54.2	9.4	1.0	5.5	71.8	1.4	10.9	2.3	7,089	12,760	-----	-----	-----
			2	-----	33.4	56.8	9.8	1.1	5.1	75.0	1.5	7.5	-----	7,417	13,350	-----	-----	-----
			3	-----	37.1	62.9	-----	1.2	5.7	83.2	1.7	8.2	-----	8,222	14,800	-----	-----	-----
ARMSTRONG COUNTY.																		
Applewood, opposite Kittanning; Snyder mine, Lower Kittanning bed (1,200 feet southwest of mine mouth).	28,664	B	1	3.1	36.6	50.0	10.3	4.2	-----	-----	-----	-----	2.3	7,289	13,120	2,090	193	-----
Same (1,125 feet north-northwest of mine mouth).	28,665	B	1	2.9	40.5	46.7	9.9	4.0	-----	-----	-----	-----	2.0	7,350	13,230	2,220	193	-----
Same (composite of samples 28664 and 28665)	28,666	B	1	3.1	38.2	48.7	10.0	4.1	5.4	72.1	1.2	7.2	3.2	7,322	13,180	-----	193	-----
			2	-----	39.4	50.3	10.3	4.2	5.2	74.4	1.2	4.7	-----	7,556	13,600	-----	-----	-----
			3	-----	43.9	56.1	-----	4.7	5.8	82.9	1.4	5.2	-----	8,428	15,170	-----	-----	-----
Avonmore, ½ mile east of; Avonmore mine, Pittsburgh bed (face of 24 room, 14 left entry, main entry, 10,000 feet north of mine mouth).	85,661	B	1	2.0	35.2	53.4	9.4	1.6	-----	-----	-----	-----	1.2	7,489	13,480	2,570	-----	136
Same (face of 30 room, 15 left heading, 11,000 feet north of mine mouth).	85,662	B	1	2.5	34.0	53.6	9.9	1.7	-----	-----	-----	-----	1.6	7,406	13,330	2,510	-----	-----
Same (composite of samples 85661 and 85662)	85,663	B	1	2.3	34.5	53.7	9.5	1.7	5.2	74.3	1.6	7.7	1.4	7,472	13,450	-----	-----	-----
			2	-----	35.3	55.0	9.7	1.7	5.1	76.0	1.6	5.9	-----	7,644	13,760	-----	-----	-----
			3	-----	39.1	60.9	-----	1.9	5.6	84.2	1.8	6.5	-----	8,467	15,240	-----	-----	-----
Cadogan, ½ mile south of; Dover mine, Upper Freeport bed (face of 2 room, straight heading)	83,364	B	1	3.6	35.2	55.4	5.8	1.6	-----	-----	-----	-----	2.6	7,611	13,700	2,570	-----	137
Same (left rib, 1 right entry, at air-break)	83,365	B	1	3.5	35.0	53.2	8.3	2.4	-----	-----	-----	-----	2.4	7,394	13,310	2,510	-----	-----
Same (face of 8 room, 1 left entry)	83,366	B	1	3.7	34.3	55.6	6.4	1.8	-----	-----	-----	-----	2.7	7,550	13,590	2,510	-----	-----
Same (composite of samples 83364 to 83366 inclusive)	83,367	B	1	3.6	34.9	54.7	6.8	1.8	5.3	75.7	1.3	9.1	2.5	7,544	13,580	-----	-----	-----
			2	-----	36.2	56.7	7.1	1.8	5.1	78.5	1.3	6.2	-----	7,828	14,090	-----	-----	-----
			3	-----	39.0	61.0	-----	2.0	5.5	84.5	1.4	6.6	-----	8,422	15,160	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ARMSTRONG COUNTY—Continued																		
Chickasaw; Chickasaw No. 1 mine, Lower Kittanning bed (right rib of 5 butt entry, 600 feet from 2 north entry).	83,492	B	1	2.4	38.5	53.0	6.1	2.2	-----	-----	-----	-----	1.4	7,661	13,790	2,280	-----	137
Same (right rib of 17 right entry, 200 feet from north entry).	83,493	B	1	2.2	28.0	53.2	6.6	3.7	-----	-----	-----	-----	1.2	7,572	13,630	2,240	-----	-----
Same (left rib, main straight heading, 3 north entry).	83,494	B	1	2.4	38.1	50.9	8.6	4.0	-----	-----	-----	-----	1.5	7,380	13,300	2,220	-----	-----
Same (right rib, 1 north entry, 500 feet from mine mouth).	83,495	B	1	3.1	39.7	49.8	7.4	3.8	-----	-----	-----	-----	2.1	7,438	13,390	2,240	-----	-----
Same (composite of samples 83492 to 83495 inclusive).	83,496	B	1	2.5	38.5	51.8	7.2	3.4	5.4	74.6	1.4	8.0	1.6	7,539	13,570	-----	-----	-----
			2	-----	39.5	53.1	7.4	3.5	5.2	76.5	1.4	6.0	-----	7,733	13,920	-----	-----	-----
			3	-----	42.6	57.4	-----	3.7	5.6	82.6	1.5	6.6	-----	8,356	15,040	-----	-----	-----
Cowanshannock, ½ mile north of; Dominion No. 3 mine Lower Kittanning bed (face of 6 room, 2 left entry)	83,571	B	1	2.0	37.7	51.3	9.0	5.4	-----	-----	-----	-----	1.2	7,428	13,370	2,180	-----	138
Same (face of 2 left entry)	83,572	B	1	2.2	36.1	50.7	11.0	6.7	-----	-----	-----	-----	1.4	7,228	13,010	2,200	-----	-----
Same (face of 5 room, back heading)	83,573	B	1	2.2	36.2	53.2	8.4	5.7	-----	-----	-----	-----	1.5	7,456	13,420	2,140	-----	-----
Same (composite of samples 83571 to 83573 inclusive).	83,574	B	1	2.1	37.3	51.2	9.4	5.8	5.1	72.4	1.3	6.0	1.4	7,389	13,300	-----	-----	-----
			2	-----	38.2	52.2	9.6	5.9	4.9	74.0	1.3	4.3	-----	7,550	13,590	-----	-----	-----
			3	-----	42.2	57.8	-----	6.5	5.5	81.9	1.4	4.7	-----	8,356	15,040	-----	-----	-----
Dayton, ⅓ mile east of; Hollow No. 3 mine, Upper Freeport bed (face of 2 room, 2 butt heading, 3 west entry).	81,579	B	1	2.4	34.9	55.2	7.5	2.0	-----	-----	-----	-----	1.2	7,683	13,830	2,190	-----	138
Same (face of back heading, 10 left entry)	81,580	B	1	3.2	34.4	54.2	8.2	1.7	-----	-----	-----	-----	2.0	7,544	13,580	2,280	-----	-----
Same (face of 1 room, 6 west entry)	81,581	B	1	2.2	32.8	54.1	10.9	2.4	-----	-----	-----	-----	1.2	7,378	13,280	2,280	-----	-----
Same (composite of samples 81579 to 81581 inclusive).	81,582	B	1	2.7	34.0	54.4	8.9	2.0	5.1	74.8	1.3	7.9	1.5	7,539	13,570	-----	-----	-----
			2	-----	34.9	55.9	9.2	2.1	5.0	76.9	1.3	5.5	-----	7,750	13,950	-----	-----	-----
			3	-----	38.4	61.6	-----	2.2	5.5	84.6	1.5	6.2	-----	8,528	15,350	-----	-----	-----
Dickey Station; Pine Creek mine, Lower Kittanning bed (left rib, 1 right entry, 100 feet from face).	83,488	B	1	5.0	35.9	51.7	7.4	3.7	-----	-----	-----	-----	3.9	7,328	13,190	2,180	-----	139
Same (face of 2 right entry)	83,489	B	1	2.9	37.4	52.2	7.5	4.3	-----	-----	-----	-----	1.9	7,450	13,410	2,130	-----	-----
Same (face of main heading)	83,490	B	1	2.4	38.0	52.8	6.8	3.0	-----	-----	-----	-----	1.5	7,594	13,670	2,240	-----	-----

Same (composite of samples 83488 to 83490 inclusive),	83,491	B	1	3.3	37.3	52.1	7.3	3.7	5.3	74.2	1.3	8.2	2.4	7,461	13,430	-------	-----	-----
			2	-----	38.6	53.9	7.5	3.8	5.1	76.8	1.3	5.5	-----	7,717	13,890	-------	-----	-----
			3	-----	41.7	58.3	------	4.1	5.5	83.0	1.4	6.0	-----	8,344	15,020	-------	-----	-----
Eddyville, ½ mile north of; Eagle mine, Lower Kittanning bed (face of main heading).	83,317	B	1	3.3	36.7	51.9	8.1	4.6	-----	------	-----	-----	2.6	7,450	13,410	2,110	-----	139
Same (face of 3 room, 1 left entry),	83,318	B	1	2.2	37.0	52.0	8.8	4.5	-----	------	-----	-----	1.5	7,506	13,510	2,130	-----	-----
Same (face of 10 room, 2 left entry),	83,319	B	1	2.5	36.9	52.4	8.2	3.3	-----	------	-----	-----	1.8	7,500	13,500	2,280	-----	-----
Same (composite of samples 83317 to 83319 inclusive),	83,320	B	1	2.7	36.7	52.3	8.3	4.1	5.2	74.0	1.4	7.0	2.0	7,467	13,440	-------	-----	-----
			2	-----	37.8	53.7	8.5	4.2	5.0	76.0	1.4	4.9	-----	7,672	13,810	-------	-----	-----
			3	-----	41.3	58.7	------	4.6	5.5	83.1	1.5	5.3	-----	8,389	15,100	-------	-----	-----
Ford City, 1 mile southwest of; Campbell mine, Upper Kittanning bed (face of 2 right entry, 50 feet from main entry).	30,289	A	1	2.1	31.7	50.1	16.1	4.5	-----	------	-----	-----	1.1	6,811	12,260	3,010	193	-----
Same (face of main entry, 250 feet from mine mouth),	30,290	A	1	2.3	31.5	47.6	18.6	5.3	-----	------	-----	-----	1.3	6,550	11,790	2,030	193	-----
Same (face of 3 right entry, 20 feet from mine entry),	30,291	A	1	2.4	31.6	49.9	16.1	4.6	-----	------	-----	-----	1.2	6,817	12,270	2,000	193	-----
Same (composite of samples 30289 to 30291 inclusive),	30,292	A	1	2.3	31.5	49.2	17.0	4.7	4.6	66.6	1.1	6.0	1.2	6,717	12,090	-------	193	-----
			2	-----	32.2	50.4	17.4	4.8	4.4	68.2	1.1	4.1	-----	6,872	12,370	-------	-----	-----
			3	-----	39.0	61.0	------	5.8	5.3	82.5	1.4	5.0	-----	8,317	14,970	-------	-----	-----
Freeport, 1 mile north of; Century No. 2 mine, Upper Freeport bed (face of 2 room, 8 left entry).	83,564	B	1	3.2	35.2	53.3	8.3	2.9	-----	------	-----	-----	1.7	7,422	13,360	2,150	-----	140
Same (left rib, 8 right entry, main entry, 75 feet from main entry).	83,565	B	1	2.9	36.7	53.7	6.7	2.1	-----	------	-----	-----	1.6	7,578	13,640	2,180	-----	-----
Same (face of 10 room, 7 left entry),	83,566	B	1	3.6	33.7	53.7	9.0	2.4	-----	------	-----	-----	2.3	7,322	13,180	2,200	-----	-----
Same (composite of samples 83564 to 83566 inclusive),	83,567	B	1	3.3	35.4	53.2	8.1	2.4	5.3	74.3	1.4	8.5	1.9	7,439	13,390	-------	-----	-----
			2	-----	36.6	55.1	8.3	2.5	5.1	76.8	1.4	5.9	-----	7,689	13,840	-------	-----	-----
			3	-----	39.9	60.1	------	2.7	5.5	83.8	1.6	6.4	-----	8,389	15,100	-------	-----	-----
1½ miles north of; Century No. 3 mine, Upper Freeport bed (face of 2 main butt entry).	83,568	B	1	3.7	35.0	54.6	6.7	2.1	-----	------	-----	-----	2.4	7,556	13,600	2,340	-----	140
Same (face of 2 face entry),	83,569	B	1	3.4	35.4	54.6	6.6	1.4	-----	------	-----	-----	2.2	7,550	13,590	2,390	-----	-----
Same (composite of samples 83568 to 83569),	83,570	B	1	3.6	35.3	54.5	6.6	1.8	5.4	75.8	1.4	9.0	2.3	7,561	13,610	-------	-----	-----
			2	-----	36.6	56.6	6.8	1.8	5.2	78.6	1.5	6.1	-----	7,839	14,110	-------	-----	-----
			3	-----	39.3	60.7	------	1.9	5.6	84.3	1.6	6.6	-----	8,411	15,140	-------	-----	-----
Friedenhelm, ½ mile west of; Leet No. 1 mine, Lower Kittanning bed (face of back heading, 1 left entry).	83,484	B	1	2.7	37.1	52.0	8.2	3.9	-----	------	-----	-----	1.7	7,478	13,460	2,190	-----	141
Same (face of 2 right entry, 1 left entry)	83,485	B	1	2.4	38.6	51.4	7.6	3.5	-----	------	-----	-----	1.4	7,550	13,590	2,150	-----	-----
Same (face of 17 room, main entry),	83,486	B	1	2.2	38.8	49.0	10.0	5.1	-----	------	-----	-----	1.3	7,267	13,080	2,150	-----	-----
Same (composite of samples 83484 to 83486 inclusive),	83,487	B	1	2.3	37.4	51.6	8.7	4.1	5.2	73.4	1.3	7.3	1.5	7,439	13,390	-------	-----	-----
			2	-----	38.3	52.8	8.9	4.2	5.1	75.1	1.3	5.4	-----	7,617	13,710	-------	-----	-----
			3	-----	42.1	57.9	------	4.6	5.6	82.5	1.5	5.8	-----	8,367	15,060	-------	-----	-----
Furnace Run; Furnace Run No. 1 mine, Lower Kittanning bed (face of 15 room, 6 right butt, 3 south face heading).	83,506	B	1	1.8	38.2	52.5	7.5	3.6	-----	------	-----	-----	1.3	7,572	13,630	2,280	-----	141
Same (left rib, 3 south face heading, 200 feet from face).	83,507	B	1	1.9	37.4	54.2	6.5	3.7	-----	------	-----	-----	1.3	7,600	13,680	2,280	-----	-----
Same (face of 7 left butt, 3 south face heading),	83,508	B	1	2.1	37.1	53.2	7.6	4.1	-----	------	-----	-----	1.6	7,522	13,540	2,280	-----	-----
Same (composite of samples 83506 to 83508 inclusive),	83,509	B	1	2.0	38.1	52.9	7.0	3.8	5.3	75.2	1.4	7.3	1.4	7,572	13,630	-------	-----	-----
			2	-----	38.9	53.9	7.2	3.9	5.1	76.8	1.4	5.6	-----	7,728	13,910	-------	-----	-----
			3	-----	41.8	58.1	------	4.2	5.5	82.7	1.5	6.1	-----	8,322	14,980	-------	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ARMSTRONG COUNTY—Continued																		
Furnace Run No. 6 mine, Lower Kittanning bed (face of 3 north face heading).	83,502	B	1	2.3	39.2	48.2	10.3	6.2	-----	-----	-----	-----	1.7	7,289	13,120	2,340	-----	141
Same (face of 10 right butt, 3 north face heading),	83,503	B	1	1.9	38.7	48.5	10.9	6.1	-----	-----	-----	-----	1.4	7,261	13,070	2,280	-----	-----
Same (face of 9 room, 9 left butt, 3 north face heading).	83,504	B	1	1.9	38.8	48.1	11.2	6.6	-----	-----	-----	-----	1.4	7,233	13,020	2,280	-----	-----
Same (composite of samples 83502 to 83504 inclusive),	83,505	B	1	2.1	38.4	48.9	10.6	6.3	5.1	70.6	1.3	6.1	1.5	7,283	13,110	-----	-----	-----
			2	-----	39.2	50.0	10.8	6.5	5.0	72.1	1.3	4.3	-----	7,439	13,390	-----	-----	-----
			3	-----	44.0	56.0	-----	7.3	5.6	80.8	1.5	4.8	-----	8,344	15,020	-----	-----	-----
Godfrey Station; Majestic No. 1 mine, Upper Freeport bed (face of 2 left entry).	83,654	B	1	3.3	35.8	54.0	6.9	2.2	-----	-----	-----	-----	2.3	7,561	13,610	2,130	-----	142
Same (face of 1 left entry),	83,655	B	1	3.5	35.2	54.4	6.9	2.1	-----	-----	-----	-----	2.6	7,528	13,550	2,180	-----	-----
Same (composite of samples 83654 and 83655),	83,656	B	1	3.2	35.8	54.1	6.9	2.3	5.4	76.0	1.5	7.9	2.3	7,572	13,630	-----	-----	-----
			2	-----	37.0	55.9	7.1	2.4	5.2	78.5	1.6	5.2	-----	7,822	14,080	-----	-----	-----
			3	-----	39.8	60.2	-----	2.6	5.6	84.5	1.7	5.6	-----	8,422	15,160	-----	-----	-----
Johnetta; Johnetta shaft mine, Lower Kittanning bed (face of 1 right entry).	83,595	B	1	2.8	35.6	51.9	9.7	3.5	-----	-----	-----	-----	2.2	7,356	13,240	2,240	-----	142
Same (right rib, 6 face entry, 1 right entry, 40 feet from face).	83,596	B	1	2.1	37.2	52.5	8.2	2.4	-----	-----	-----	-----	1.6	7,578	13,640	2,240	-----	-----
Same (face of main entry),	83,597	B	1	2.3	37.5	52.4	7.8	2.3	-----	-----	-----	-----	1.7	7,617	13,710	2,280	-----	-----
Same (composite of samples 83595 to 83597 inclusive)	83,598	B	1	2.4	36.7	52.5	8.4	2.7	5.3	75.1	1.4	7.1	1.9	7,528	13,550	-----	-----	-----
			2	-----	37.6	53.8	8.6	2.7	5.1	76.9	1.4	5.3	-----	7,717	13,890	-----	-----	-----
			3	-----	41.1	58.9	-----	3.0	5.6	84.2	1.6	5.6	-----	8,444	15,200	-----	-----	-----
Kelly Station; Benson mine, Lower Freeport bed (face of main heading, 200 feet from mine mouth).	83,627	B	1	3.7	32.0	50.0	14.3	3.9	-----	-----	-----	-----	3.1	6,844	12,320	2,390	-----	143
Same (face of 1 left entry),	83,628	B	1	3.1	31.7	50.1	15.1	3.9	-----	-----	-----	-----	2.4	6,839	12,310	2,390	-----	-----
Same (composite of samples 83627 and 83628),	83,629	B	1	3.4	31.8	50.0	14.8	3.9	4.9	67.8	1.2	7.4	2.8	6,800	12,240	-----	-----	-----
			2	-----	32.9	51.8	15.3	4.0	4.7	70.2	1.3	4.5	-----	7,044	12,680	-----	-----	-----
			3	-----	38.8	61.2	-----	4.7	5.5	82.9	1.5	5.4	-----	8,317	14,970	-----	-----	-----

Provident No. 2 mine, Upper Freeport bed (face of 1 face heading).	83,623	B	1	3.3	35.4	52.3	9.0	3.7					2.6	7,383	13,290	2,040		
Same (face of 2 face heading),	83,624	B	1	2.4	36.1	53.2	8.3	3.2					1.8	7,517	13,530	2,040		
Same (face of 5 room, back heading, 2 face),	83,625	B	1	2.9	35.9	52.0	9.2	3.5					2.3	7,400	13,320	2,130		
Same (composite of samples 83623 to 83625 inclusive)	83,626	B	1	2.9	35.5	52.7	8.9	3.4	5.2	73.8	1.2	7.5	2.2	7,439	13,390			
			2		36.6	54.3	9.1	3.5	5.1	76.0	1.2	5.1		7,656	13,780			
			3		40.2	59.8		3.9	5.6	83.7	1.4	5.4		8,428	15,170			
Kittanning; Baxter mine, Lower Kittanning bed (face right entry).	83,166	B	1	2.6	36.7	52.3	8.4	3.2					1.8	7,511	13,520	2,130		144
Same (face of 3 right entry),	83,167	B	1	2.4	38.0	51.8	7.8	3.6					1.6	7,550	13,590	2,190		
Same (face of main aircourse heading),	83,168	B	1	2.4	37.1	53.5	7.0	2.9					1.7	7,622	13,720	2,190		
Same (composite of samples 83166 to 83168 inclusive),	83,169	B	1	2.4	37.2	52.5	7.9	3.2	5.3	75.2	1.3	7.1	1.7	7,572	13,630			
			2		38.1	53.9	8.0	3.3	5.2	77.0	1.4	5.1		7,756	13,960			
			3		41.4	58.6		3.6	5.6	83.7	1.5	5.6		8,433	15,180			
Buffington No. 2 mine, Upper Freeport bed (left rib, main heading, 50 feet beyond 1 left entry).	83,163	B	1	3.1	34.9	51.2	10.8	2.4					2.1	7,206	12,970	2,390		144
Same (left rib, 1 room, to left entry, 1 left heading, 50 feet from face).	83,164	B	1	3.2	34.2	52.0	10.6	2.4					2.1	7,178	12,920	2,390		
Same (composite of samples 83163 and 83164),	83,165	B	1	3.2	34.1	51.9	10.8	2.3	4.9	71.6	1.4	9.0	2.1	7,189	12,940			
			2		35.2	53.7	11.1	2.4	4.7	74.0	1.4	6.4		7,428	13,370			
			3		39.6	60.4		2.7	5.2	83.3	1.6	7.2		8,356	15,040			
2 miles south of, Toy mine, Upper Freeport bed (face of 10 left heading).	83,110	B	1	3.4	35.0	52.0	9.6	2.8					2.2	7,311	13,160	2,340		144
Same (face of 14 room, 2 left heading),	83,111	B	1	3.0	35.6	50.5	10.9	3.2					2.0	7,200	12,960	2,390		
Same (face of 1 right entry, 2 left heading),	83,112	B	1	3.4	34.9	50.6	11.1	2.9					2.3	7,172	12,910	2,390		
Same (composite of samples 83110 to 83112 inclusive),	83,113	B	1	3.2	34.8	51.5	10.5	3.0	5.1	71.9	1.3	8.2	2.2	7,244	13,040			
			2		36.0	53.2	10.8	3.1	4.9	74.3	1.3	5.6		7,483	13,470			
			3		40.3	59.7		3.4	5.5	83.3	1.5	6.3		8,394	15,110			
Leechburg, 1 mile northeast of; Armstrong mine, Lower Freeport bed (face of 15 left entry, in Riggle section).	85,767	B	1	2.5	34.5	55.0	8.0	2.8					1.6	7,500	13,500	2,100		145
Same (face of 31 left entry, upper Steele main, 9,000 feet northeast of mine mouth).	85,768	B	1	2.1	35.3	55.5	7.1	2.3					1.2	7,628	13,730	2,060		
Same (face of 7 right butt, 4 main, lower Steele, 3,000 feet east of mine mouth).	85,769	B	1	2.5	36.0	54.6	6.9	2.2					1.5	7,639	13,750	2,040		
Same (composite of samples 85767 to 85769 inclusive),	85,770	B	1	2.4	35.0	55.3	7.3	2.4	5.3	75.8	1.4	7.8	1.4	7,572	13,630			
			2		35.8	56.7	7.5	2.5	5.1	77.7	1.5	5.7		7,756	13,960			
			3		38.7	61.3		2.7	5.6	84.0	1.6	6.1		8,389	15,100			
1 mile west of; West Leechburg mine, Upper Freeport bed (face of main entry, 5,300 feet north of mine mouth).	85,759	B	1	2.1	36.8	53.3	7.8	3.4					1.1	7,589	13,660	2,060		145
Same (face of 15 right butt, main entry),	85,760	B	1	2.2	37.0	54.3	6.5	2.9					1.2	7,689	13,840	2,110		
Same (face of 12 left butt, main entry),	85,761	B	1	1.9	36.8	53.8	7.5	3.1					1.1	7,589	13,660	2,090		
Same (composite of samples 85759 to 85761 inclusive),	85,762	B	1	2.1	36.4	54.2	7.3	3.1	5.3	75.3	1.5	7.5	1.1	7,611	13,700			
			2		37.2	55.3	7.5	3.1	5.2	77.0	1.5	5.7		7,778	14,000			
			3		40.2	59.8		3.4	5.6	83.2	1.6	6.2		8,400	15,120			
Logansport; Raridan mine, Upper Freeport bed (face of main entry, 1,200 feet east of mine mouth).	28,667	B	1	3.4	35.2	51.2	10.2	3.2					2.3	7,228	13,010	2,140	193	
Same (face of main entry, 3,600 feet northeast of mine mouth).	28,668	B	1	2.7	35.0	51.6	10.7	3.2					1.5	7,239	13,030	2,170	193	

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ARMSTRONG COUNTY—Continued																		
Same (composite of samples 28667 and 28668),	28,669	B	1	3.2	34.8	51.5	10.5	3.2	5.2	71.0	1.3	8.8	1.9	7,233	13,020	----	193	----
			2	----	36.0	53.1	10.9	3.3	5.0	73.3	1.3	6.2	----	7,467	13,440	----	----	----
			3	----	40.4	59.6	----	3.8	5.6	82.3	1.5	6.8	----	8,378	15,080	----	----	----
McWilliams, 1½ miles north of; Hines Bank, Upper Freeport bed (face of 1 left entry).	83,255	B	1	4.0	33.3	54.0	8.7	1.6	----	----	----	----	3.2	7,283	13,110	2,510	----	146
Same (face of 2 right entry),	83,256	B	1	3.5	34.8	53.9	7.8	1.7	----	----	----	----	2.7	7,456	13,420	2,370	----	----
Same (composite of samples 83255 and 83256),	83,257	B	1	3.7	33.6	54.6	8.1	1.6	5.1	74.0	1.4	9.8	2.9	7,389	13,300	----	----	----
			2	----	34.9	56.7	8.4	1.7	4.8	76.9	1.4	6.8	----	7,678	13,820	----	----	----
			3	----	38.1	61.9	----	1.8	5.3	84.0	1.6	7.3	----	8,383	15,090	----	----	----
Mohawk; Mohawk No. 3 mine, Lower Kittanning bed (face of 8 room, 14 right entry).	83,497	B	1	2.6	38.0	53.6	5.8	2.9	----	----	----	----	1.6	7,733	13,920	2,240	----	146
Same (face of main heading),	83,498	B	1	2.1	39.5	53.5	4.9	2.2	----	----	----	----	1.1	7,867	14,160	2,280	----	----
Same (face of 13 left entry),	83,499	B	1	1.9	38.1	56.0	4.0	1.9	----	----	----	----	1.0	7,928	14,270	2,310	----	----
Same (left rib, at 19 room, 8 right entry),	83,500	B	1	2.0	37.9	54.5	5.6	2.6	----	----	----	----	1.0	7,761	13,970	2,340	----	----
Same (composite of samples 83497 to 83500 inclusive),	83,501	B	1	2.1	38.0	54.8	5.1	2.3	5.5	78.3	1.5	7.3	1.2	7,844	14,120	----	----	----
			2	----	38.8	56.0	5.2	2.4	5.3	80.0	1.6	5.5	----	8,011	14,420	----	----	----
			3	----	41.0	59.0	----	2.5	5.6	84.4	1.7	5.8	----	8,451	15,210	----	----	----
Montgomeryville; Montgomeryville mine, Middle Kittanning bed (face of 6 room, 1 left entry, cannel coal).	28,774	B	1	1.7	33.1	36.9	28.3	3.4	----	----	----	----	.6	5,856	10,540	2,360	193	----
Same (face of crosscut, 2 left entry, cannel coal),	28,775	B	1	1.8	32.8	37.1	28.3	3.9	----	----	----	----	.7	5,811	10,460	2,300	193	----
Same (composite of samples 28774 and 28775),	28,776	B	1	1.8	32.8	37.2	28.2	3.7	4.5	56.9	1.1	5.6	.7	5,811	10,460	----	193	----
			2	----	33.4	37.9	28.7	3.7	4.4	57.9	1.1	4.2	----	5,917	10,650	----	----	----
			3	----	46.8	53.2	----	5.2	6.2	81.2	1.6	5.8	----	8,294	14,930	----	----	----
New Bethlehem, 2 miles south of; Pine Run No. 6 mine, Lower Freeport bed (right rib, back heading, 1,000 feet from fan).	82,885	B	1	3.1	35.2	54.6	7.1	2.6	----	----	----	----	2.1	7,517	13,530	2,200	----	147
Same (face of main heading)	82,886	B	1	3.2	36.1	52.7	8.0	3.0	----	----	----	----	2.2	7,411	13,340	2,200	----	----
Same (composite of samples 82885 and 82886),	82,887	B	1	3.3	35.0	54.4	7.3	2.7	5.4	74.6	1.4	8.6	2.2	7,456	13,420	----	----	----
			2	----	36.2	56.3	7.5	2.8	5.2	77.2	1.4	5.9	----	7,706	13,870	----	----	----
			3	----	39.1	60.9	----	3.0	5.7	83.5	1.5	6.3	----	8,333	15,000	----	----	----

2 miles south of; Pine Run No. 10 mine, Upper Freeport bed (face of 5 butt heading, main heading).	82,881	B	1	3.8	35.4	53.7	7.1	1.8	----	----	----	----	2.5	7,483	13,470	2,360	----	----
Same (face of main heading)	82,882	B	1	3.3	35.6	52.9	8.2	2.4	----	----	----	----	2.1	7,417	13,350	2,340	----	----
Same (face of 4 left heading)	82,883	B	1	3.7	35.1	54.3	6.8	1.7	----	----	----	----	2.4	7,533	13,560	2,300	----	----
Same (composite of samples 82881 to 82883 inclusive)	82,884	B	1	3.5	35.3	53.7	7.5	2.0	5.5	75.2	1.4	8.4	2.4	7,472	13,450	----	----	----
			2	----	36.6	55.6	7.8	2.1	5.3	78.0	1.4	5.4	----	7,750	13,950	----	----	----
			3	----	39.7	60.3	----	2.2	5.7	84.5	1.5	6.1	----	8,406	15,130	----	----	----
Oak Hill: Oak Hill mine, Upper Freeport bed (face of 7 room, 3 left heading).	83,650	B	1	2.7	35.8	55.1	6.4	2.2	----	----	----	----	1.8	7,611	13,700	2,130	----	148
Same (face of 5 room, 3 butt back heading)	83,651	B	1	3.1	35.6	54.0	7.3	2.4	----	----	----	----	2.2	7,539	13,570	2,130	----	----
Same (face of 1 room, 1 face heading)	83,652	B	1	2.9	34.7	53.6	8.8	3.1	----	----	----	----	2.0	7,400	13,320	2,130	----	----
Same (composite of samples 83650 to 83652 inclusive)	83,653	B	1	2.9	34.9	54.6	7.6	2.7	5.3	75.6	1.5	7.3	2.0	7,506	13,610	----	----	----
			2	----	36.0	56.2	7.8	2.8	5.1	77.9	1.5	4.9	----	7,728	13,910	----	----	----
			3	----	39.0	61.0	----	3.0	5.6	84.4	1.6	5.4	----	8,378	15,080	----	----	----
Putneyville, 1 mile west of; Sandy Hollow mine, Upper Freeport bed (face of 2 butt heading).	83,321	B	1	3.9	35.2	52.9	8.0	2.7	----	----	----	----	2.9	7,411	13,340	2,280	----	148
Same (face of north heading, east main heading)	83,322	B	1	3.1	34.7	54.2	8.0	3.1	----	----	----	----	2.2	7,439	13,390	2,280	----	----
Same (face of south heading)	83,323	B	1	2.9	33.6	55.5	8.0	3.0	----	----	----	----	1.9	7,467	13,440	2,240	----	----
Same (composite of samples 83321 to 83323 inclusive)	83,324	B	1	3.3	34.6	54.2	7.9	3.0	5.4	74.4	1.4	7.9	2.3	7,450	13,410	----	----	----
			2	----	35.8	56.0	8.2	3.1	5.2	76.9	1.4	5.2	----	7,706	13,870	----	----	----
			3	----	39.0	61.0	----	3.3	5.7	83.8	1.5	5.7	----	8,394	15,110	----	----	----
Rimer, ½ mile west of; Peach Hill mine, Lower Kittanning bed (left rib, 4 left heading, at 3 room).	83,208	B	1	2.8	39.4	50.0	7.8	3.0	----	----	----	----	1.8	7,466	13,440	2,360	----	148
Same (left rib, main heading, 50 feet from face)	83,209	B	1	2.5	38.3	51.1	8.1	3.9	----	----	----	----	1.5	7,494	13,490	2,160	----	----
Same (left rib, 4 right heading, at 6 room)	83,210	B	1	3.0	36.8	51.2	9.0	4.5	----	----	----	----	2.0	7,306	13,150	2,150	----	----
Same (composite of samples 83208 to 83210) inclusive	83,211	B	1	2.8	38.2	50.8	8.2	3.7	5.3	73.2	1.3	8.3	1.8	7,434	13,380	----	----	----
			2	----	39.3	52.2	8.5	3.8	5.2	75.3	1.3	5.9	----	7,650	13,770	----	----	----
			3	----	42.9	57.1	----	4.1	5.6	82.3	1.5	6.5	----	8,356	15,040	----	----	----
1 mile south of; Rimerton mine, Lower Kittanning bed (face of 10 room, 12 right butt heading).	83,212	B	1	2.7	37.7	50.4	9.2	3.2	----	----	----	----	2.0	7,372	13,270	2,340	----	149
Same (face of main heading)	83,213	B	1	3.3	36.1	48.4	12.2	3.8	----	----	----	----	2.3	7,100	12,780	2,280	----	----
Same (face of 6 room, 9 left butt heading)	83,214	B	1	2.7	37.9	49.9	9.5	4.4	----	----	----	----	1.8	7,372	13,270	2,340	----	----
Same (composite of samples 83212 to 83214 inclusive)	83,215	B	1	2.9	37.4	49.4	10.3	3.7	5.2	71.7	1.3	7.8	2.0	7,250	13,050	----	----	----
			2	----	38.5	50.9	10.6	3.8	5.1	73.9	1.3	5.3	----	7,467	13,440	----	----	----
			3	----	43.1	56.9	----	4.3	5.6	82.6	1.5	6.0	----	8,350	15,320	----	----	----
Sagamore; No. 17 mine, Upper Freeport bed (left rib, 22 rib heading, 2 "C" heading, 30 feet from face).	81,575	B	1	2.0	32.9	57.2	7.9	2.5	----	----	----	----	.9	7,633	13,740	2,240	----	149
Same (face of 25 right heading)	81,576	B	1	3.0	33.4	53.9	9.7	2.6	----	----	----	----	1.9	7,428	13,370	2,280	----	----
Same (left rib, 17 right heading, 20 feet from face)	81,577	B	1	2.5	35.7	55.9	5.9	1.7	----	----	----	----	1.4	7,767	13,980	2,350	----	----
Same (composite of samples 81575 to 81577 inclusive)	81,578	B	1	2.5	34.2	55.4	7.9	2.3	5.3	76.4	1.5	6.6	1.4	7,633	13,740	----	----	----
			2	----	35.1	56.8	8.1	2.4	5.1	78.3	1.5	4.6	----	7,822	14,080	----	----	----
			3	----	38.2	61.8	----	2.6	5.6	85.2	1.6	5.0	----	8,517	15,330	----	----	----
Seminole; Seminole No. 2 mine, Upper Freeport bed (face of 3 right butt heading, 1 north heading).	83,349	B	1	3.4	33.8	56.0	6.8	1.8	----	----	----	----	2.5	7,550	13,590	2,240	----	15[illegible]
Same (face of 2 left butt heading, 2 north heading)	83,350	B	1	3.3	34.7	56.0	6.0	1.0	----	----	----	----	2.4	7,583	13,650	2,570	----	----
Same (composite of samples 83349 and 83350)	83,354	B	1	3.3	34.3	56.2	6.2	1.4	5.1	75.9	1.5	9.9	2.5	7,572	13,630	----	----	----
			2	----	35.5	58.1	6.4	1.4	4.9	78.5	1.5	7.3	----	7,833	14,100	----	----	----
			3	----	37.9	62.1	----	1.5	5.3	83.9	1.6	7.7	----	8,367	15,060	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ARMSTRONG COUNTY—Continued																		
Seminole No. 14 mine (face of 2 right heading, 2 left butt heading).	83,351	B	1	3.5	34.5	56.4	5.6	1.3					2.6	7,611	13,700	2,280		150
Same (face of main heading, in 14 main heading)	83,352	B	1	3.7	35.5	56.6	4.2	.9					2.8	7,700	13,860	2,740		
Same (face of 4 left butt heading, 14 main heading)	83,353	B	1	2.0	35.7	56.9	5.4	1.4					1.1	7,767	13,980	2,510		
Same (composite of samples 83351 to 83353 inclusive)	83,355	B	1	3.1	35.1	57.0	4.8	1.3	5.4	77.8	1.5	9.2	2.2	7,706	13,870			
			2		36.2	58.8	5.0	1.3	5.2	80.2	1.5	6.8		7,950	14,310			
			3		38.1	61.9		1.4	5.5	84.4	1.6	1.7		8,367	15,060			
Templeton, ¼ mile south of; Templeton No. 2 mine, Upper Freeport bed (face of 1 east heading).	83,205	B	1	3.6	33.2	55.0	8.2	1.0					2.3	7,389	13,300	2,620		151
Same (face of 1 left entry)	83,206	B	1	4.7	31.8	56.7	6.8	.8					3.4	7,400	13,320	2,850		
Same (composite of samples 83205 to 83206)	83,207	B	1	4.0	32.5	55.9	7.6	.9	5.4	75.0	1.4	9.7	2.8	7,378	13,280			
			2		33.8	58.2	8.0	1.0	5.1	78.1	1.5	6.3		7,689	13,840			
			3		36.7	63.3		1.1	5.6	84.9	1.6	6.8		8,356	15,040			
Thayerton; Mahoning River mine, Upper Freeport bed (face of 1 left heading).	83,325	B	1	3.0	35.7	56.4	4.9	1.3					1.7	7,794	14,030	2,340		151
Same (face of 2 right heading).	83,326	B	1	2.8	36.8	55.5	4.9	1.2					1.5	7,789	14,020	2,370		
Same (face of 2 heading)	83,327	B	1	3.0	35.6	55.5	5.9	2.3					1.8	7,644	13,760	2,240		
Same (composite of samples 83325 to 83327 inclusive)	83,328	B	1	2.9	35.6	56.4	5.1	1.6	5.4	77.7	1.5	8.7	1.7	7,739	13,930			
			2		36.6	58.1	5.3	1.6	5.2	80.0	1.6	6.3		7,972	14,350			
			3		38.7	61.3		1.7	5.5	84.5	1.6	6.7		8,417	15,150			
Vandergrift; Climax mine, Upper Freeport bed (face of main entry, 700 feet north of mine mouth).	85,704	B	1	3.0	34.0	56.5	6.5	2.3					1.6	7,706	13,870	2,180		151
Same (face of 2 left entry, main entry)	85,705	B	1	3.4	34.0	56.4	6.2	2.0					2.1	7,683	13,830	2,240		
Same (composite of samples 85704 and 85705)	85,706	B	1	3.1	34.4	56.1	6.4	2.2	5.4	76.8	1.5	7.7	1.8	7,706	13,870			
			2		35.5	57.9	6.6	2.2	5.2	79.3	1.6	5.1		7,956	14,320			
			3		38.0	62.0		2.4	5.6	84.8	1.7	5.5		8,511	15,320			
Kepple mine, Upper Freeport bed (face of 6 right entry, main entry).	85,700	B	1	2.8	34.3	54.4	8.5	2.1					1.4	7,533	13,560	2,220		152
Same (face of main entry, 1,200 feet northeast of mine mouth).	85,701	B	1	2.9	34.5	54.3	8.3	2.3					1.5	7,533	13,560	2,240		

Same (face of 3 room, 2 left entry).	85,702	B	1	4.0	34.3	53.3	8.4	2.4	----	----	----	----	2.8	7,439	13,390	2,2[illegible]0	----	----
Same (composite of samples 85700 to 85702 inclusive).	85,703	B	1	5.2	34.8	53.6	8.4	2.3	5.3	74.5	1.4	8.1	1.9	7,4[illegible]9	13,4[illegible]0	----	----	----
			2	----	35.9	55.4	8.7	2.4	5.1	77.0	1.5	5.3	----	7,739	13,9[illegible]0	----	----	----
			3	----	39.3	60.7	----	2.6	5.6	84.3	1.6	5.9	----	8,478	15,260	----	----	----
West Kittanning, 1 mile north of; Neals mine, lower Freeport bed (face of right entry, main entry).	28,721	B	1	3.3	34.7	51.0	11.0	3.5	----	----	----	----	1.9	7,1[illegible]8	12,8[illegible]0	2,0[illegible]0	193	----
Same (face of main entry).	28,722	B	1	3.5	36.3	51.8	8.4	2.8	----	----	----	----	2.2	7,378	13,[illegible]80	2,070	193	----
Same (composite of samples 28721 and 28722).	28,723	B	1	3.4	35.5	51.4	9.7	3.1	5.3	71.4	1.3	9.2	2.1	7,2[illegible]4	13,040	----	193	----
			2	----	36.8	53.1	10.1	3.2	5.1	73.9	1.4	6.3	----	7,[illegible]00	13,[illegible]00	----	----	----
			3	----	40.9	59.1	----	3.6	5.7	82.2	1.6	6.9	----	7,3[illegible]9	15,010	----	----	----
Yatesboro; Cowanshannock No. 3 mine, Lower Freeport bed (face of 1 left entry).	28,672	B	1	3.1	33.5	52.8	10.6	3.4	----	----	----	----	2.2	7,322	13,1[illegible]0	2,050	193	----
Same (face of 1 right entry).	28,673	B	1	2.9	33.6	53.0	10.5	2.8	----	----	----	----	2.0	7,328	13,190	2,100	193	----
Same (composite of samples 28672 and 28673).	28,674	B	1	3.0	33.5	52.9	10.6	3.0	5.2	71.8	1.2	8.2	2.1	7,350	13,2[illegible]0	----	193	----
			2	----	34.5	54.6	10.9	3.1	5.0	74.1	1.3	5.6	----	7,578	13,640	----	----	----
			3	----	38.7	61.3	----	3.5	5.6	83.1	1.4	6.4	----	8,506	15,310	----	----	----
BEAVER COUNTY.																		
Cannelton Station, ¼ mile north of; Robin Hood mine, Middle Kittanning bed (100 yds. in entry, from north pit mouth).	34,637	A	1	4.6	36.2	53.8	5.4	1.2	----	----	----	----	2.4	7,4[illegible]7	13,440	2,130	----	----
Same (on rib, 100 yds. in entry, from south pit mouth).	34,638	A	1	6.1	33.6	56.0	4.3	.7	----	----	----	----	3.5	7,328	13,1[illegible]0	2,2[illegible]0	----	----
Same (composite of samples 34637 and 34638).	34,659	A	1	5.4	34.9	54.8	4.9	1.1	5.6	75.1	1.5	11.8	3.0	7,[illegible]94	13,310	----	----	----
			2	----	36.9	57.9	5.2	1.1	5.3	79.3	1.6	7.5	----	7,817	14,070	----	----	----
			3	----	38.9	61.1	----	1.2	5.6	83.7	1.7	7.8	----	8,244	14,840	----	----	----
½ mile north of; Saratoga Fire Clay mine, Lower Mercer bed (face of 6 room, 2 left entry, 400 yds. from mine mouth).	34,653	B	1	3.8	36.7	48.3	11.2	3.8	----	----	----	----	2.0	7,033	12,660	2,090	----	----
Same (right rib, 400 yds. in main entry).	34,654	B	1	3.4	34.0	44.8	17.8	4.9	----	----	----	----	1.6	6,439	11,5[illegible]0	1,960	----	----
Same (composite of samples 34653 and 34654).	34,655	B	1	3.6	35.2	46.8	14.4	4.2	5.1	66.5	1.3	8.5	1.8	6,739	12,1[illegible]0	----	----	----
			2	----	36.6	48.5	14.9	4.4	4.9	68.9	1.3	5.6	----	6,989	12,580	----	----	----
			3	----	43.0	57.0	----	5.2	5.8	81.0	1.5	6.5	----	8,217	14,790	----	----	----
¾ mile west of; Pittsburgh-Cannelton mine, Upper Freeport bed (in main entry, 400 feet from mouth).	80,462	B	1	4.7	35.5	53.2	6.6	1.6	5.6	74.2	1.5	10.5	2.9	7,314	13,2[illegible]0	2,240	----	153
			2	----	37.2	55.9	6.9	1.7	5.3	77.8	1.6	6.7	----	7,706	13,870	----	----	----
			3	----	40.0	60.0	----	1.8	5.7	83.6	1.7	7.2	----	8,278	14,900	----	----	----
1 mile northwest of; Cannelton-clay mine, Upper Freeport bed, (475 yds. in 1 right entry, left room).	34,656	A	1	4.6	36.8	52.3	6.2	2.2	----	----	----	----	2.6	7,439	13,390	1,980	----	153
Same (face of 1 right entry, 500 feet from mine mouth).	34,657	A	1	4.4	37.8	51.5	6.3	1.8	----	----	----	----	2.2	7,417	13,350	2,160	----	----
Same (composite of samples 34656 and 34657).	34,658	A	1	4.5	37.0	52.2	6.3	2.0	5.5	74.2	1.5	10.5	2.3	7,411	13,340	----	----	----
			2	----	38.8	54.6	6.6	2.1	5.3	71.7	1.6	6.7	----	7,767	13,980	----	----	----
			3	----	41.5	58.5	----	2.2	5.6	83.2	1.7	7.3	----	8,317	14,970	----	----	----
1½ miles northwest of; Beaver-Cannel mine, Upper Kittanning bed (face of 1 right entry, main entry, 400 yds from mine mouth).	34,650	B	1	3.5	38.8	49.9	7.8	3.1	----	----	----	----	1.5	7,444	13,400	1,960	----	152
Same (face of 22 left room, main entry, 400 yds. from mine mouth).	34,651	B	1	2.9	40.0	51.1	6.0	2.9	----	----	----	----	1.1	7,617	13,710	2,090	----	----
Same (composite of samples 34650 and 34651).	34,652	B	1	3.2	39.5	50.3	7.0	3.0	5.6	74.6	1.6	8.2	1.3	7,528	13,550	----	----	----
			2	----	40.8	52.0	7.2	3.1	5.4	77.1	1.7	5.5	----	7,778	14,000	----	----	----
			3	----	43.9	56.1	----	3.3	5.8	83.1	1.8	6.0	----	8,383	15,090	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
BEAVER COUNTY—Continued.																		
Smiths Ferry, 2 miles north of; Island Run mine, Upper Freeport bed (2/3 mile east of mine mouth).	25,587	B	1	4.4	37.2	53.5	4.9	1.4	5.4	75.4	2.0	10.9	1.9	7,583	13,650	2,200	193	-----
			2	-----	38.9	56.0	5.1	1.5	5.1	78.9	2.1	7.3	-----	7,933	14,280	-----	-----	-----
			3	-----	41.0	59.0	-----	1.5	5.4	83.1	2.2	7.8	-----	8,356	15,040	-----	-----	-----
BEDFORD COUNTY.																		
Hopewell, 2 miles southeast of; Cambria No. 2 mine, Upper Freeport bed (face of Young heading).	W46,790	A	1	1.2	16.3	72.0	10.5	1.7	-----	-----	-----	-----	-----	7,650	13,770	-----	123	-----
Same face of left level, dip heading).	W46,791	A	1	1.1	16.7	69.4	12.8	2.4	-----	-----	-----	-----	-----	7,423	13,370	-----	123	-----
Same (face of main air entry).	W46,792	A	1	1.3	16.4	70.7	11.6	2.1	-----	-----	-----	-----	-----	7,556	13,600	-----	123	-----
Same (face of last room in Fisher heading).	W46,793	A	1	1.2	16.3	70.5	12.0	1.7	-----	-----	-----	-----	-----	7,483	13,410	-----	123	-----
Same (face of 9 room, inby 4 side track on main level).	W46,794	A	1	1.1	16.6	71.3	11.0	2.2	-----	-----	-----	-----	-----	7,594	13,600	-----	123	-----
Same (composite of samples W46790 to W46794 inclusive).	19,611	A	1	1.2	16.4	70.8	11.6	1.9	4.2	77.8	1.4	3.1	-----	7,567	13,620	-----	123	-----
			2	-----	16.6	71.7	11.7	1.9	4.2	78.7	1.4	2.1	-----	7,616	13,780	-----	-----	-----
			3	-----	18.8	81.2	-----	2.2	4.7	80.1	1.6	2.4	-----	8,672	15,610	-----	-----	-----
2 miles east of; Cambria No. 3 mine, Upper Freeport bed (face of 7 room 2 heading, 7,000 feet northeast of shaft).	15,055	A	1	1.6	15.9	68.7	13.8	2.0	-----	-----	-----	-----	1.2	7,300	13,140	2,460	85	-----
Same (600 feet to right from top of plane, 5,100 feet northeast of shaft).	15,056	A	1	1.3	16.6	71.6	10.5	1.0	-----	-----	-----	-----	1.0	7,644	13,760	3,010	85	-----
Same (face of 3 heading, 7,400 feet northeast of shaft).	15,058	A	1	1.7	15.9	69.6	12.8	2.4	-----	-----	-----	-----	1.4	7,356	13,210	2,570	85	-----
Same (face of room, 200 feet from face of 4 heading, 7,000 feet northeast of shaft).	15,059	A	1	1.6	16.8	69.7	11.9	2.2	-----	-----	-----	-----	1.2	7,494	13,490	2,730	85	-----
Same (composite of samples 15056, 15058 and 15059).	15,060	A	1	1.6	16.3	70.0	12.1	1.9	4.1	77.0	1.4	3.5	1.2	7,450	13,410	-----	85	-----
			2	-----	16.6	71.1	12.3	2.0	4.0	78.3	1.5	1.9	-----	7,567	13,620	-----	-----	-----
			3	-----	18.9	81.1	-----	2.3	4.5	89.2	1.7	2.3	-----	8,613	15,540	-----	-----	-----
3 miles southeast of; Chevington No. 3 mine, Barnett bed (face of 1 room, dip heading, 300 feet from mine mouth).	W46,785	A	1	1.3	17.3	76.0	5.4	1.3	-----	-----	-----	-----	-----	8,133	14,640	-----	123	-----

Same (face of dip heading, 500 feet from mine mouth).	W46,786	A	1	2.0	16.5	75.5	6.0	1.6	-----	-----	-----	-----	-----	7,989	14,380	-----	123	-----
Same (composite of samples W46785 and W46786).	19,613	A	1	1.7	16.7	75.7	5.9	1.5	4.5	83.5	1.3	3.3	-----	8,061	14,510	-----	123	-----
			2	-----	16.9	77.1	6.0	1.5	4.3	84.9	1.3	2.0	-----	8,200	14,760	-----	-----	-----
			3	-----	18.0	82.0	-----	1.6	4.6	90.3	1.4	2.1	-----	8,717	15,690	-----	-----	-----
3⅜ miles southeast of; Glendale No. 2 mine, Barnett bed (face of last room, on level heading, 400 feet from mine mouth).	W46,787	A	1	1.3	17.3	75.3	6.1	1.4	-----	-----	-----	-----	-----	8,028	14,450	-----	123	-----
Same.	W46,788	A	1	1.2	17.7	74.4	6.7	1.4	-----	-----	-----	-----	-----	8,039	14,470	-----	123	-----
Same (composite of samples W46787 and W46788).	19,612	A	1	1.3	17.8	74.2	6.7	1.4	4.4	82.8	1.3	3.4	-----	8,033	14,460	-----	123	-----
			2	-----	18.0	75.3	6.7	1.5	4.3	83.8	1.4	2.3	-----	8,133	14,640	-----	-----	-----
			3	-----	19.3	80.7	-----	1.6	4.6	89.9	1.5	2.4	-----	8,722	15,700	-----	-----	-----
Same Glendale No. 1 mine (face of level drift, 1,000 feet from mine mouth).	W46,789	A	1	1.4	18.4	75.5	4.7	1.1	-----	-----	-----	-----	-----	8,189	14,740	-----	123	-----
			2	-----	18.7	76.5	4.8	1.1	-----	-----	-----	-----	-----	8,306	14,950	-----	-----	-----
BLAIR COUNTY.																		
Coupon, ½ mile east of; Horseshoe mine, Lower Kittanning bed (right rib of 1 room, 1 right entry, 50 feet from face).	81,677	B	1	2.7	30.6	60.7	6.0	.9	-----	-----	-----	-----	1.8	7,854	14,130	2,910	-----	153
Same (right rib, 1 right entry, main entry, 100 feet from face).	81,678	B	1	3.4	29.0	62.5	5.1	.8	-----	-----	-----	-----	2.4	7,872	14,170	2,910	-----	-----
Same (composite of samples 81677 and 81678).	81,679	B	1	3.1	30.5	60.7	5.7	.8	5.3	79.6	1.5	7.1	2.1	7,856	14,140	-----	-----	-----
			2	-----	31.4	62.8	5.8	.9	5.1	82.1	1.5	4.6	-----	8,100	14,580	-----	-----	-----
			3	-----	33.4	66.6	-----	.9	5.4	87.2	1.6	4.9	-----	8,606	15,490	-----	-----	-----
½ mile east of; Russet No. 2 mine, Brookville bed (face of 1 left entry).	81,680	B	1	3.1	27.8	58.7	10.4	1.5	-----	-----	-----	-----	2.3	7,333	13,200	2,740	-----	154
Same (face of 3 room, 3 right entry).	81,681	B	1	2.7	27.8	58.2	11.3	2.3	-----	-----	-----	-----	1.9	7,306	13,150	2,590	-----	-----
Same (face of 3 room, 2 left entry).	81,682	B	1	2.6	26.3	59.7	11.4	2.1	-----	-----	-----	-----	1.8	7,322	13,180	2,680	-----	-----
Same (composite of samples 81680 to 81692 inclusive).	81,683	B	1	2.8	27.5	58.6	11.1	1.9	4.8	74.6	1.2	6.4	2.0	7,311	13,160	-----	-----	-----
			2	-----	28.3	60.3	11.4	2.0	4.6	76.7	1.2	4.1	-----	7,522	13,540	-----	-----	-----
			3	-----	31.9	68.1	-----	2.2	5.2	86.7	1.4	4.5	-----	8,494	15,290	-----	-----	-----
Glen White, 1 mile from; Glen White No. 2 mine, Upper Freeport bed (on rib, 65 room, 6 right entry, 10 feet from entry).	30,830	A	1	3.0	31.9	57.7	7.4	2.6	-----	-----	-----	-----	2.1	7,739	13,930	2,120	193	-----
Same (on rib, 1 slant entry, 1 left entry, 40 feet inside of entry).	30,831	A	1	2.2	29.7	62.1	6.0	1.1	-----	-----	-----	-----	1.3	7,939	14,290	2,460	193	-----
Same (on rib, main slope entry, 6 right entry, 70 feet from face).	30,832	A	1	3.4	28.5	61.4	6.7	2.0	-----	-----	-----	-----	2.5	7,772	13,990	2,140	193	-----
Same (composite of samples 30830 to 30832 inclusive).	30,833	A	1	2.8	30.0	60.5	6.7	1.9	5.1	78.8	1.4	6.1	2.0	7,811	14,060	-----	193	-----
			2	-----	30.8	62.3	6.9	1.9	4.9	81.0	1.5	3.8	-----	8,033	14,460	-----	-----	-----
			3	-----	33.1	66.9	-----	2.1	5.2	87.0	1.6	4.1	-----	8,628	15,530	-----	-----	-----
BRADFORD COUNTY.																		
Long Valley, 2 miles northwest of; Long Valley mine, Clarion bed (400 yards in entry).	75,523	B	1	2.0	18.4	69.8	9.8	.9	-----	-----	-----	-----	1.4	7,600	13,680	3,000	-----	154
Same (500 yards in entry).	75,524	B	1	1.9	18.0	66.4	13.7	1.2	-----	-----	-----	-----	1.1	7,206	12,970	3,000	-----	-----
Same (composite of samples 75523 and 75524).	75,525	B	1	2.1	18.0	68.0	11.9	1.1	4.3	76.4	1.1	5.2	1.3	7,428	13,370	-----	-----	-----
			2	-----	18.4	69.5	12.1	1.1	4.2	78.1	1.1	3.4	-----	7,583	13,650	-----	-----	-----
			3	-----	20.9	79.1	-----	1.3	4.8	88.8	1.2	3.9	-----	8,628	15,530	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—**Continued**

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
BUTLER COUNTY.																		
Bruin; Bruin mine, Brookville bed (face of 11 butt heading, 4 room, 600 yds. from mine mouth).	34,819	B	1	3.3	37.1	46.5	13.1	2.4	-----	-----	-----	-----	1.4	6,889	12,400	2,220	-----	-----
Same (face of 7 butt heading, 6 room, 600 yds. from mine mouth).	34,820	B	1	3.5	37.4	50.0	9.1	2.4	-----	-----	-----	-----	1.4	7,261	13,070	2,480	-----	-----
Same (composite of samples 34819 and 34820	34,821	B	1	3.3	37.4	48.3	11.0	2.4	5.2	70.6	1.3	9.5	1.4	7,089	12,760	-----	-----	-----
			2	-----	38.6	50.0	11.4	2.5	5.0	73.0	1.4	6.7	-----	7,328	13,190	-----	-----	-----
			3	-----	43.6	56.4	-----	2.8	5.6	82.4	1.6	7.6	-----	8,278	14,900	-----	-----	-----
Butler; Muntz mine, Upper Freeport bed (1 mile southeast of mine mouth).	23,128	B	1	3.0	36.8	52.7	7.5	3.0	5.4	74.7	1.4	8.0	1.0	7,511	13,520	2,030	123	-----
			2	-----	37.9	54.3	7.8	3.1	5.2	77.0	1.5	5.4	-----	7,739	13,930	-----	-----	-----
			3	-----	41.1	58.9	-----	3.3	5.7	83.4	1.6	6.0	-----	8,389	15,100	-----	-----	-----
1 mile east of; Thompson mine, Upper Kittanning bed (250 feet northeast of shaft).	23,064	B	1	4.4	34.4	54.2	7.0	2.0	5.3	74.5	1.4	9.8	2.6	7,433	13,380	2,230	123	-----
			2	-----	35.9	56.8	7.3	2.1	5.0	77.9	1.5	6.2	-----	7,772	13,990	-----	-----	-----
			3	-----	38.8	61.2	-----	2.3	5.4	84.0	1.6	6.7	-----	8,389	15,100	-----	-----	-----
2 miles north of; Zenith No. 1 mine, Upper Kittanning bed (face of 2 entry, 1,500 feet northwest of mine mouth).	23,132	B	1	3.7	35.8	56.1	4.4	.8	-----	-----	-----	-----	1.7	7,717	13,890	3,010	123	-----
Same (face of 3 entry, 1,000 feet southwest of mine mouth).	23,133	B	1	4.0	36.3	55.4	4.3	.9	-----	-----	-----	-----	1.7	7,711	13,880	3,010	123	-----
Same (composite of samples 23132 and 23133)	23,134	B	1	3.7	35.8	56.1	4.4	.9	5.5	77.3	1.5	10.4	1.7	7,700	13,860	-----	123	-----
			2	-----	37.2	58.3	4.5	.9	5.3	80.3	1.6	7.4	-----	8,000	14,400	-----	-----	-----
			3	-----	39.0	61.0	-----	1.0	5.5	84.1	1.7	7.7	-----	8,378	15,080	-----	-----	-----
2 miles southeast of; Vogatey mine, Upper Freeport bed (2,200 feet north of mine mouth).	23,065	B	1	3.8	34.1	52.6	9.5	3.6	5.1	71.7	1.3	8.8	2.1	7,233	13,020	2,050	123	-----
			2	-----	35.5	54.6	9.9	3.7	4.8	74.5	1.3	5.8	-----	7,517	13,530	-----	-----	-----
			3	-----	39.4	60.6	-----	4.1	5.4	82.7	1.5	6.3	-----	8,339	15,010	-----	-----	-----
Chicora, 1 mile southwest of; Cunningham mine, Upper Freeport bed (15 room, 1 right entry, straight entry, 3,600 feet southwest of mine mouth).	23,066	B	1	4.9	32.1	54.8	8.2	1.2	5.3	73.4	1.3	10.6	2.9	7,233	13,020	3,000	123	-----
			2	-----	33.8	57.5	8.7	1.3	4.9	77.2	1.4	6.5	-----	7,606	13,690	-----	-----	-----
			3	-----	37.0	63.0	-----	1.4	5.4	84.5	1.5	7.2	-----	8,328	14,990	-----	-----	-----

Claytonia; Stage mine, Middle Kittanning (?) bed (face of 1 working breast, 2 right entry, 1½ miles north of mine mouth).	23,126	B	1	3.7	35.4	47.4	13.5	3.8	5.2	68.4	1.3	7.8	2.0	6,894	12,410	2,130	123	-----
			2	-----	36.8	49.2	14.0	3.9	5.0	71.1	1.4	4.6	-----	7,161	12,890	-----	-----	-----
			3	-----	42.8	57.2	-----	4.5	5.8	82.6	1.6	5.5	-----	8,322	14,980	-----	-----	-----
Evans City, 6 miles north of; Young Shaft mine, Upper Freeport bed (200 feet northwest of shaft).	25,823	B	1	3.5	41.4	49.7	5.4	3.6	5.4	74.8	1.2	9.6	2.1	7,583	13,650	2,110	193	-----
			2	-----	42.9	51.5	5.6	3.7	5.2	77.5	1.2	6.8	-----	7,856	14,140	-----	-----	-----
			3	-----	45.4	54.6	-----	3.9	5.5	82.1	1.3	7.2	-----	8,317	14,970	-----	-----	-----
Goss Station, 1 mile east of; Annandale No. 2 mine, Brookville bed (face of 2 main entry).	26,241	A	1	3.0	36.9	44.0	16.1	3.8	-----	-----	-----	-----	1.5	6,672	12,010	2,480	193	-----
Same (face of 3 room, 2 right main entry)	26,242	A	1	2.9	37.7	46.4	13.0	3.2	-----	-----	-----	-----	1.3	6,950	12,510	2,520	193	-----
Same (face of 5 left entry, 20 feet inby 14 room, 39 sec).	26,243	A	1	3.5	37.2	44.3	15.0	3.9	-----	-----	-----	-----	1.7	6,717	12,090	2,430	193	-----
Same (face of 3 room, 3 right entry, 1 sec)	25,244	A	1	3.5	37.5	47.4	11.6	3.2	-----	-----	-----	-----	1.7	7,028	12,650	2,580	193	-----
Same (composite of samples 26241 to 26244 inclusive)	26,245	A	1	3.2	37.4	45.6	13.8	3.5	4.9	67.5	1.0	9.3	1.5	6,828	12,290	-----	193	-----
			2	-----	38.6	47.1	14.3	3.6	4.7	69.7	1.1	6.6	-----	7,056	12,700	-----	-----	-----
			3	-----	45.1	54.9	-----	4.2	5.5	81.3	1.2	7.8	-----	8,228	14,810	-----	-----	-----
Harbison Station, 1 mile northwest of; McSnulty mine, Upper Freeport bed (face of 1 right entry, main entry, 500 feet southwest of entrance).	85,804	B	1	2.9	36.0	50.1	11.0	3.4	-----	-----	-----	-----	2.0	7,178	12,920	2,200	-----	155
Same (face of 3 room, 1 right entry)	85,805	B	1	3.1	34.8	52.8	9.3	2.7	-----	-----	-----	-----	1.9	7,372	13,270	2,240	-----	-----
Same (composite of samples 85804 and 85805)	85,806	B	1	3.2	35.0	51.8	10.0	3.1	5.3	72.3	1.4	7.9	2.0	7,278	13,100	-----	-----	-----
			2	-----	36.1	53.6	10.3	3.2	5.1	74.6	1.5	5.3	-----	7,511	13,520	-----	-----	-----
			3	-----	40.3	59.7	-----	3.5	5.6	83.2	1.6	6.1	-----	8,378	15,080	-----	-----	-----
Harmony Junction; North Pittsburgh Realty Co. mine, Middle Kittanning bed (face of 3 room, 2 entry).	25,615	B	1	5.8	37.9	45.6	10.7	4.3	5.7	68.6	1.2	9.5	4.6	6,917	12,450	2,050	193	-----
			2	-----	40.2	48.4	11.4	4.5	5.4	72.8	1.3	4.6	-----	7,339	13,210	-----	-----	-----
			3	-----	45.4	54.6	-----	5.1	6.1	82.2	1.4	5.2	-----	8,283	14,910	-----	-----	-----
Jamisonville, 1 mile north of; Victoria mine, Upper Freeport bed (face of main entry, 3,000 feet east-northeast of mine mouth).	23,129	B	1	3.3	35.1	51.6	10.0	3.4	-----	-----	-----	-----	1.3	7,200	12,960	2,020	123	-----
Same (breast of room, 7 right entry, 1,700 feet east of mine mouth).	23,130	B	1	3.1	35.2	49.1	12.6	2.4	-----	-----	-----	-----	1.2	6,987	12,580	2,360	123	-----
Same (composite of samples 23129 and 23130)	23,131	B	1	3.2	35.0	50.6	11.2	2.9	5.1	70.6	1.5	8.7	1.2	7,083	12,750	-----	123	-----
			2	-----	36.2	52.3	11.5	3.0	4.9	73.0	1.5	6.1	-----	7,322	13,180	-----	-----	-----
			3	-----	40.9	59.1	-----	3.4	5.6	82.5	1.7	6.8	-----	8,278	14,900	-----	-----	-----
Jefferson Center, 1½ miles southwest of; Reamer mine, Upper Freeport bed (1,200 feet northwest of mine mouth).	23,127	B	1	4.6	33.0	54.4	8.0	1.3	5.4	73.9	1.4	10.0	2.4	7,333	13,200	2,150	123	-----
			2	-----	34.5	57.1	8.4	1.3	5.1	77.4	1.5	6.3	-----	7,683	13,830	-----	-----	-----
			3	-----	37.7	62.3	-----	1.4	5.6	84.5	1.6	6.9	-----	8,389	15,100	-----	-----	-----
Kepples Station; Kepple mine, Upper Freeport bed (face of 3 left entry, main entry, 1,200 feet east of entrance).	85,774	B	1	2.4	34.3	52.8	10.5	1.9	-----	-----	-----	-----	1.2	7,289	13,120	2,180	-----	155
Same (face of 1 room, 3 left entry, main entry, 900 feet northeast of entrance).	85,775	B	1	2.5	38.2	53.7	5.6	2.3	-----	-----	-----	-----	1.7	7,672	13,810	2,130	-----	-----
Same (composite of samples 85774 and 85775)	85,776	B	1	2.4	36.1	53.4	8.1	2.0	5.3	74.6	1.4	8.6	1.5	7,506	13,510	-----	-----	-----
			2	-----	37.0	54.7	8.3	2.1	5.2	76.4	1.5	6.5	-----	7,694	13,850	-----	-----	-----
			3	-----	40.3	59.7	-----	2.3	5.7	83.4	1.6	7.0	-----	8,389	15,100	-----	-----	-----
Nealey; Nealey drift mine, Middle Kittanning bed (at face, 700 feet north of mine mouth).	25,822	B	1	5.3	36.5	48.0	10.2	3.7	5.4	69.4	1.2	10.1	3.7	6,989	12,580	1,990	193	-----
			2	-----	38.6	50.6	10.8	3.9	5.0	73.3	1.3	5.7	-----	7,383	13,290	-----	-----	-----
			3	-----	43.2	56.8	-----	4.4	5.6	82.2	1.4	6.4	-----	8,272	14,890	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
BUTLER COUNTY—Continued.																		
Sarver, 1½ miles southwest of; Custom bank, Upper Freeport bed (face of 1 room, 1 left entry).	85,771	B	1	2.3	36.3	54.2	7.2	1.9	-----	-----	-----	-----	1.3	7,533	13,560	2,130	-----	155
Same (right rib, main entry, 500 feet north of entrance, 100 feet from face).	85,772	B	1	2.7	35.3	55.6	6.4	1.8	-----	-----	-----	-----	1.5	7,589	13,660	2,130	-----	-----
Same (composite of samples 85771 and 85772)	85,773	B	1	2.6	36.0	54.5	6.9	1.8	5.4	75.8	1.5	8.6	1.4	7,578	13,640	-----	-----	-----
			2	-----	36.9	56.0	7.1	1.9	5.3	77.8	1.5	6.4	-----	7,772	13,990	-----	-----	-----
			3	-----	39.7	60.3	-----	2.0	5.7	83.7	1.7	6.9	-----	8,367	15,060	-----	-----	-----
Unionville, ½ mile east of; Eagle mine, Upper Freeport bed (face of main entry, 1,500 feet south of mine mouth).	23,125	B	1	3.2	36.9	53.6	6.3	2.6	5.4	74.8	1.6	9.3	1.3	7,533	13,560	2,220	123	-----
			2	-----	38.1	55.4	6.5	2.7	5.2	77.3	1.6	6.7	-----	7,789	14,020	-----	-----	-----
			3	-----	40.8	59.2	-----	2.9	5.6	82.7	1.7	7.1	-----	8,328	14,990	-----	-----	-----
CAMBRIA COUNTY.																		
Bakerton; ½ mile east of; Sterling No. 1 mine, Lower Kittanning bed (2 pillar, 2 right entry, main entry, 1,200 feet southwest of mine mouth).	8,995	A	1	3.3	16.5	74.6	5.6	1.1	-----	-----	-----	-----	2.3	8,011	14,420	-----	22	-----
Same (composite of 3 face samples)	9,035	A	1	2.9	17.0	73.4	6.7	1.7	4.7	80.1	1.2	5.6	2.0	7,950	14,310	-----	22	-----
			2	-----	18.0	75.1	6.9	1.7	4.5	82.6	1.2	3.1	-----	8,189	14,740	-----	-----	-----
			3	-----	19.0	81.0	-----	1.9	4.8	88.7	1.3	3.3	-----	8,800	15,840	-----	-----	-----
Same (face of 1 room, 3 cross entry, 7 left entry, 3 dip entry).	W69,680	A	1	2.7	22.5	68.9	5.9	1.6	-----	-----	-----	-----	-----	7,944	14,300	-----	193	-----
			2	-----	23.1	70.8	6.1	1.6	-----	-----	-----	-----	-----	8,161	14,690	-----	-----	-----
Same (No. 3 pillar, Gypsy cross heading, 2 dip entry).	W69,681	A	1	1.6	22.7	69.2	6.5	1.3	-----	-----	-----	-----	-----	7,978	14,360	-----	193	-----
			2	-----	23.1	70.3	6.6	1.4	-----	-----	-----	-----	-----	8,111	14,600	-----	-----	-----
Same (face of 4 dip entry, main entry)	W69,682	A	1	3.4	23.0	67.4	6.2	1.3	-----	-----	-----	-----	-----	7,889	14,200	-----	193	-----
			2	-----	23.8	69.8	6.4	1.3	-----	-----	-----	-----	-----	8,161	14,690	-----	-----	-----
Sterling No. 3 mine, Lower Kittanning bed (face of 40 room, machine heading).	W69,686	A	1	1.7	26.0	66.4	5.9	1.5	-----	-----	-----	-----	-----	7,994	14,390	-----	193	-----
			2	-----	26.4	67.6	6.0	1.6	-----	-----	-----	-----	-----	8,128	14,630	-----	-----	-----
Same (face of Sharkey heading)	W69,687	A	1	2.6	25.6	65.6	6.2	1.4	-----	-----	-----	-----	-----	7,900	14,220	-----	193	-----
			2	-----	26.3	67.3	6.4	1.4	-----	-----	-----	-----	-----	8,111	14,600	-----	-----	-----
Same (face of 6 left entry)	W69,688	A	1	1.8	25.9	66.2	6.1	1.1	-----	-----	-----	-----	-----	8,000	14,400	-----	193	-----
			2	-----	26.4	67.4	6.2	1.1	-----	-----	-----	-----	-----	8,167	14,700	-----	-----	-----

Sterling No. 5 mine, Lower Kittanning bed (composite of 2 face samples).	9,034	A	1	3.2	18.5	72.4	5.9	1.3	4.8	80.4	1.3	6.3	2.5	7,956	14,320		22	
			2		19.0	74.9	6.1	1.3	4.6	83.1	1.3	3.6		8,217	14,790			
			3		20.5	79.5		1.4	4.9	88.5	1.4	3.8		8,750	15,750			
Same (face of main pillar, 1 left entry)	W69,679	A	1	2.2	22.7	69.3	5.8	1.2						8,000	14,400		193	
			2		25.2	70.9	5.9	1.2						8,178	14,720			
Same (rib, 10 room, 5 left entry)	W69,683	A	1	3.1	21.9	67.2	7.8	2.0						7,750	13,950		193	
			2		22.6	69.4	8.0	2.1						7,994	14,390			
Same (face of 4 right main entry, 1 entry)	W69,684	A	1	2.3	23.5	67.6	6.6	1.6						7,889	14,200		193	
			2		24.0	69.3	6.7	1.6						8,072	14,530			
Sterling No. 6 mine, Lower Kittanning bed (pillar of 2 and 3 entries, dip entry, 3,200 feet southwest of mine mouth).	8,998	A	1	2.7	19.5	71.1	6.7	1.7					2.1	7,867	14,160		22	
Same (composite of 4 face samples)	9,052	A	1	3.4	18.5	71.4	6.7	1.5	4.8	80.1	1.1	5.8	2.8	7,872	14,170		22	
			2		19.0	74.1	6.9	1.6	4.6	82.9	1.1	2.9		8,144	14,660			
			3		20.5	79.5		1.7	4.9	89.0	1.2	3.2		8,750	15,750			
Same (left rib, 10 feet from face of 4 right main entry).	W69,685	A	1	2.2	22.2	70.3	5.3	1.1						8,033	14,460		193	
			2		22.7	71.9	5.4	1.1						8,217	14,790			
Same (on right rib, 25 feet from face of 17 left heading).	W69,689	A	1	2.5	22.3	69.8	5.4	1.0						8,000	14,400		193	
			2		22.9	71.6	5.5	1.1						8,211	14,780			
Same (face of 12 right heading)	W69,690	A	1	2.4	22.3	69.2	6.1	1.1						7,961	14,330		193	
			2		22.8	71.0	6.2	1.1						8,156	14,680			
Same (face of 2 right entry, 8 left entry)	W69,691	A	1	3.0	22.6	69.8	4.6	.7						8,069	14,470		193	
			2		23.3	72.0	4.7	.7						8,283	14,910			
Barnesboro; Lancashire No. 10 mine, Upper Freeport bed (4 right heading).	7,958	B	1	2.6	21.8	67.6	8.0	2.0	5.1	78.7	1.2	5.0	1.8	7,806	14,050		22	
			2		22.4	69.4	8.2	2.1	4.9	80.7	1.3	2.8		8,011	14,420			
			3		24.3	75.7		2.3	5.4	87.9	1.4	3.0		8,722	15,700			
Same (5 right heading)	7,957	B	1	2.7	22.0	66.4	8.9	1.5					1.8	7,678	13,820		22	
			2		22.6	68.3	9.1	1.6						7,894	14,210			
Lancashire No. 12 mine, Lower Freeport bed (11 left heading).	7,953	B	1	4.4	19.2	68.9	7.5	1.7	5.2	77.8	1.2	6.6	3.4	7,617	13,710		22	
			2		20.1	72.0	7.9	1.8	4.9	81.4	1.2	2.8		7,972	14,350			
			3		21.8	78.2		1.9	5.3	88.3	1.3	3.2		8,650	15,570			
Same (13 right heading)	7,963	B	1	3.1	20.6	70.0	6.3	1.1					2.5	7,917	14,250		22	
			2		21.3	72.3	6.4	1.2						8,172	14,710			
¾ mile northeast of; Delta mine, Lower Freeport or D bed (30 room, 12 left entry, 4,500 feet from mine mouth).	10,262	A	1	2.7	22.0	68.5	6.8	1.6					2.1	7,889	14,200	2,410	22	
Same (16 left entry, off main, 5,500 feet from mine mouth).	10,285	A	1	2.6	23.0	67.8	6.6	1.4					2.1	7,900	14,220	2,540	22	
Same (18 left entry, off main, 6,500 feet from mine mouth).	10,287	A	1	3.0	22.0	68.4	6.6	1.5					2.4	7,872	14,170	2,520	22	
Same (14 left entry, off main)	10,286	A	1	2.8	22.6	67.9	6.7	1.6					2.3	7,850	14,130	2,400	22	
Same (composite of samples 10262, 10285 to 10287 inclusive).	10,292	A	1	2.9	21.4	69.2	6.5	1.5	5.0	80.5	1.2	5.2	2.2	7,878	14,180		22	
			2		22.1	71.2	6.7	1.6	4.8	82.9	1.2	2.8		8,111	14,600			
			3		23.6	76.4		1.7	5.2	88.8	1.3	3.0		8,683	15,630			
1 mile east of; Allport mine, Lower Freeport bed (face of 2 left entry, 9 heading, main heading, 6,250 feet southeast of mine mouth).	W19,740	A	1	3.5	20.9	68.2	7.4	1.8						7,739	13,930		85	
Same (rib in 7 room, 2 left entry, 9 right entry, main heading, 6,250 feet southeast of mine mouth)	W19,741	A	1	2.9	20.7	68.8	7.6	1.8						7,806	14,050		85	
Same (face of 9 right entry, main heading, 6,950 feet southeast of mine mouth)	W19,742	A	1	2.3	21.9	69.2	6.6	1.4						7,933	14,280		85	

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (composite of samples W19740 to W19742 inclusive)	12,221	A	1	1.8	21.7	69.1	7.4	1.8	4.7	80.3	1.4	4.4	-----	7,906	14,230	-----	85	-----
			2	-----	22.1	70.3	7.6	1.8	4.6	81.8	1.4	2.8	-----	8,044	14,480	-----	-----	-----
			3	-----	23.9	76.1	-----	2.0	5.0	88.4	1.5	3.1	-----	8,700	15,660	-----	-----	-----
Allport mine, Upper Freeport or E bed (face of 3 right entry, main heading, 3,700 feet southeast of mine mouth)	W19,738	A	1	2.3	22.2	67.6	7.9	1.1	-----	-----	-----	-----	-----	7,822	14,080	-----	85	-----
Same (face of main slant, main entry, 3,700 feet southeast of mine mouth)	W19,739	A	1	2.4	22.7	67.4	7.5	.8	-----	-----	-----	-----	-----	7,883	14,190	-----	85	-----
Same, (600 feet in on second panel from main slant, main entry, 2800 feet south of mine mouth)	W19,743	A	1	2.5	23.2	68.4	5.9	.7	-----	-----	-----	-----	-----	7,989	14,380	-----	85	-----
Same (composite of samples W19738, W19739 and W19743)	12,231	A	1	1.5	23.4	67.9	7.2	.8	4.8	81.1	1.4	4.7	-----	7,933	14,280	-----	85	-----
			2	-----	23.7	69.0	7.3	.8	4.7	82.3	1.4	3.5	-----	8,050	14,490	-----	-----	-----
			3	-----	25.6	74.4	-----	.9	5.1	88.8	1.5	3.7	-----	8,689	15,640	-----	-----	-----
1¾ mile east of; Cymbria mine, Lower Kittanning bed (face of 2 right entry, about 1,000 feet southwest of shaft)	W20,394	A	1	2.2	20.4	71.5	5.9	.9	-----	-----	-----	-----	-----	8,022	14,440	-----	85	-----
Same (face of 18 room, 2 left entry, 1,200 feet northeast of shaft)	Y20,395	A	1	2.1	21.7	70.8	5.4	.9	-----	-----	-----	-----	-----	8,094	14,570	-----	85	-----
Same (face of main heading, 1,900 feet from shaft)	W20,444	A	1	2.3	21.4	67.4	8.9	3.0	-----	-----	-----	-----	-----	7,728	13,910	-----	85	-----
Same (face of 3 left entry, 1,400 feet northeast of shaft)	W20,445	A	1	3.1	21.3	67.1	8.5	3.2	-----	-----	-----	-----	-----	7,694	13,850	-----	85	-----
Same (face of 3 right entry, 1,200 feet southeast of shaft)	W20,446	A	1	3.4	22.1	68.3	6.2	1.2	-----	-----	-----	-----	-----	7,944	14,300	-----	85	-----
Same (composite of samples W20394, W20395, W20444 to W20446 inclusive)	12,372	A	1	.8	22.9	69.1	7.2	2.0	4.7	81.6	1.2	3.3	-----	8,022	14,440	-----	85	-----
			2	-----	23.1	69.7	7.2	2.1	4.6	82.2	1.2	2.8	-----	8,089	14,560	-----	-----	-----
			3	-----	24.9	75.1	-----	2.2	5.0	88.7	1.3	2.8	-----	8,722	15,700	-----	-----	-----
2 miles east of; Cymbria No. 1 mine, Lower Freeport bed (face of first crosscut, 2 left entry, 5,500 feet from mine mouth)	12,162	A	1	3.4	22.7	67.0	6.9	1.8	-----	-----	-----	-----	2.8	7,800	14,040	2,430	85	-----
Same (face of 8 right, 2 left entry, 4,000 feet from mine mouth)	12,163	A	1	2.6	23.1	67.5	6.8	1.2	-----	-----	-----	-----	2.0	7,889	14,200	2,540	85	-----

Same (face of 1 left, 2 left entry, 4,000 feet from mine mouth).	12,164	A	1	3.0	23.4	67.7	5.9	1.3					2.4	7,939	14,290	2,570	85	
Same (face of 3 right, 2 main entry, 3,200 feet northeast of mine mouth).	12,170	A	1	2.8	22.7	68.0	6.5	1.6					2.2	7,883	14,190	2,340	85	
Same (face of 2 left main heading, 2,900 feet northeast of mine mouth).	12,171	A	1	3.0	23.5	67.8	5.7	1.4					2.4	7,961	14,330	2,490	85	
Same (composite of samples, 12162, 12163, 12164, 12170 and 12171).	12,165	A	1	3.1	22.5	67.9	6.5	1.6	5.0	80.4	1.3	5.2	2.4	7,878	14,180		85	
			2		23.2	70.1	6.7	1.6	4.8	83.0	1.3	2.6		8,128	14,630			
			3		24.9	75.1		1.8	5.2	88.9	1.4	2.7		8,706	15,670			
Cymbria No. 2⅔ mine, Upper Freeport bed (face of 2 left entry, 2,000 feet from mine mouth).	12,158	A	1	2.8	24.0	63.9	9.3	1.5					2.2	7,650	13,770	2,460	85	
Same (face of 12 room, main heading, 2,200 feet from mine mouth).	12,159	A	1	3.2	23.2	65.9	7.7	1.4					2.6	7,772	13,990	2,490	85	
Same (face of 3 left main heading),	12,160	A	1	3.9	22.7	65.8	7.6	1.4					3.2	7,722	13,900	2,450	85	
Same (face of 6 room, main heading, 1,500 feet southwest of mine mouth).	12,172	A	1	2.9	23.2	65.7	8.2	1.7					2.3	7,744	13,940	2,410	85	
Same (face of 8 room, 2 left heading, 1,200 feet southwest of mine mouth).	12,173	A	1	3.0	23.0	65.4	8.6	2.0					2.4	7,689	13,840		85	
Same (composite of samples 12158, 12159, 12160, 12172 and 12173).	12,161	A	1	3.0	22.9	65.7	8.4	1.6	5.0	77.9	1.3	5.8	2.5	7,728	13,910		85	
			2		23.6	67.7	8.7	1.7	4.8	80.3	1.4	3.1		7,961	14,330			
			3		25.8	74.2		1.8	5.3	87.9	1.5	3.5		8,717	15,690			
¾ mile west of; Empire A mine, Lower Freeport bed (face of 1 room, 5 left entry, new parallel heading, 14,000 feet northwest of mine mouth).	W19,643	A	1	2.6	23.3	66.9	7.2	1.3						7,817	14,070		85	
Same (face of 4 room, old 1 left heading, main entry 2,000 feet northwest of mine mouth).	W19,644	A	1	1.9	23.8	67.6	6.7	1.1						7,956	14,320		85	
Same (corner of back heading, 3 right entry, old parallel heading, 3,000 feet northeast of mine mouth).	W19,645	A	1	2.3	23.1	67.5	7.1	1.2						7,828	14,090		85	
Same (40 feet from face of parallel heading, main entry, 9,000 feet northeast of mine mouth).	W19,646	A	1	3.3	24.5	65.0	7.2	1.9						7,778	14,000		85	
Same (face of 24 room, 14 left entry, main entry, 11,000 feet northwest of mine mouth).	W19,647	A	1	2.1	22.7	66.5	8.7	1.8						7,728	13,910		85	
Same (face of 17 room, 3 left entry, new parallel heading, 14,000 feet northwest of mine mouth).	W19,648	A	1	2.4	23.5	67.2	6.9	1.5						7,883	14,190		85	
Same (composite of samples W19643 to Y19648 inclusive).	12,212	A	1	1.5	23.9	67.1	7.5	1.5	4.7	80.5	1.4	4.4		7,889	14,200		85	
			2		24.2	68.2	7.6	1.6	4.6	81.7	1.4	3.1		8,011	14,420			
			3		26.2	73.8		1.7	5.0	88.5	1.5	3.3		8,672	15,610			
Beaverdale; Pennsylvania No. 15 mine, Lower Kittanning bed (face of 1 slant, 5 right heading, 1 dip, main entry).	12,174	A	1	3.3	15.9	73.3	7.5	2.1					2.8	7,806	14,050	2,280	85	
Same (face of sump for main dip, 4 left heading, 1 dip, main entry).	12,175	A	1	2.7	16.7	75.4	5.2	.6					2.2	8,067	14,520	3,010	85	
Same (face of 1 slant, 4 right heading, 1 dip, main entry).	12,176	A	1	3.9	15.1	73.0	8.0	2.3					3.3	7,722	13,900	2,330	85	
Same (face of 1 slant, right heading, 1 dip, main entry).	12,177	A	1	3.5	15.7	74.0	6.8	1.9					3.0	7,850	14,130	2,280	85	
Same (composite of samples 12174 to 12177 inclusive).	12,178	A	1	3.4	16.2	73.5	6.9	1.8	4.6	80.6	1.2	4.9	2.8	7,839	14,110		85	
			2		16.8	76.0	7.2	1.9	4.4	83.5	1.2	1.8		8,122	14,620			
			3		18.1	81.9		2.1	4.8	89.9	1.3	1.9		8,750	15,750			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (pillar, 23 room, 3 right heading, 1 dip, main entry)	12,179	A	1	2.9	14.7	74.8	7.6	2.4	4.6	80.2	1.3	3.9	2.4	7,817	14.070	2,280	85	-----
			2	-----	15.1	77.1	7.8	2.4	4.4	82.6	1.3	1.5	-----	8,050	14,490	-----	-----	-----
			3	-----	16.4	83.6	-----	2.6	4.8	89.6	1.4	1.6	-----	8,733	15,720	-----	-----	-----
¼ mile from; Beaver Run mine, Upper Freeport bed (face of main slope, 2,000 feet north of mine mouth).	20,284	A	1	3.4	17.5	71.8	7.3	.8	-----	-----	-----	-----	2.9	7,772	13,990	2.980	123	-----
Same (face of 3 dip entry, main slope, 2,000 feet northwest of mine mouth).	20,285	A	1	3.4	17.0	70.3	9.3	2.0	-----	-----	-----	-----	3.0	7,600	13,680	2,070	123	-----
Same (face of 1 left heading, 3 dip entry, 1,200 feet northwest of mine mouth).	20,286	A	1	3.4	16.4	70.4	9.8	2.3	-----	-----	-----	-----	3.0	7,533	13,560	2,180	123	-----
Same (rib of crosscut, 100 feet outby face of 4 right heading, 2,900 feet northeast of mine mouth).	20,287	A	1	3.6	18.1	70.9	7.4	1.7	-----	-----	-----	-----	3.2	7,750	13,950	2,200	123	-----
Same (face of 3 right advance heading, 4,300 feet northeast of mine mouth).	20,288	A	1	2.7	18.1	71.8	7.4	1.1	-----	-----	-----	-----	2.2	7,822	14,080	2,050	123	-----
Same (face of slant heading, drift heading, 4,900 feet northeast of mine mouth).	20,289	A	1	3.0	18.0	70.9	8.1	2.7	-----	-----	-----	-----	2.5	7,728	13,910	2,190	123	-----
Same (composite of samples 20284 to 20289 inclusive).	20,290	A	1	3.3	17.7	70.7	8.3	1.7	4.6	79.2	1.4	4.8	2.8	7,694	13,850	-----	123	-----
			2	-----	18.3	73.1	8.6	1.8	4.4	81.9	1.4	1.9	-----	7,956	14,320	-----	-----	-----
			3	-----	20.0	80.0	-----	2.0	4.8	89.6	1.6	2.0	-----	8,700	15,660	-----	-----	-----
¼ mile north of: Logan No. 6½ mine, Lower Freeport bed (left rib, inby 70 feet from face of 2 right heading, 2 left heading, main entry, 3,000 feet southwest of mine mouth).	22,448	A	1	3.0	18.3	69.6	9.1	3.0	-----	-----	-----	-----	2.6	7,589	13,660	-----	123	-----
Same (face of 26 room, main heading, 4,200 feet southwest of mine mouth).	22,449	A	1	2.5	17.7	71.2	8.6	3.3	-----	-----	-----	-----	2.1	7,650	13,770	2,010	123	-----
Same (left rib of 11 room, back heading, 2,500 feet from 1 left heading, main entry, 1,200 feet south of mine mouth).	22,450	A	1	3.8	17.2	71.0	8.0	2.5	-----	-----	-----	-----	3.0	7,583	13,650	2,390	123	-----
Same (face of 1 right heading, 2 left heading, main entry, 3,600 feet, southwest of mine mouth).	22,451	A	1	2.5	18.6	70.5	8.4	2.6	-----	-----	-----	-----	2.0	7,678	13,820	2,500	123	-----

Same (face of main heading, 4,800 feet southwest of mine mouth).	22,452	A	1	2.5	18.5	70.9	8.1	2.3	-----	-----	-----	-----	2.0	7,728	13,910	2,300	123	-----
Same (composite of samples 22,448 to 22,452 inclusive).	22,453	A	1	2.9	18.3	70.3	8.5	2.7	4.6	78.6	1.4	4.2	2.3	7,667	13,800	-----	123	-----
			2	-----	18.8	72.5	8.7	2.8	4.4	81.0	1.4	1.7	-----	7,824	14,210	-----	-----	-----
			3	-----	20.6	79.4	-----	3.1	4.8	88.7	1.6	1.8	-----	8,650	15,570	-----	-----	-----
Bens Creek, 1 mile east of: Bens Creek No. 1 mine, Lower Kittanning bed (face of 6 heading, 1 dip, 700 feet southeast of shaft).	W19,736	A	1	2.6	16.6	74.8	6.0	.8	-----	-----	-----	-----	-----	8,028	14,450	-----	85	-----
Same (barrier pillar, on No. 2 side track, 100 feet from 21 room, 3,200 feet southwest of old main heading).	W19,697	A	1	2.1	17.0	74.7	6.2	1.1	-----	-----	-----	-----	-----	8,017	14,430	-----	85	-----
Same (pillar on No. 1 side track, between mainway and 1 room, 1,200 feet west of shaft).	W19,700	A	1	3.4	16.3	74.7	5.6	.6	-----	-----	-----	-----	-----	7,956	14,3[illegible]0	-----	85	-----
Same (main pillar of old main heading, 900 feet southwest of shaft).	W19,702	A	1	3.7	17.7	72.7	5.9	.7	-----	-----	-----	-----	-----	7,9[illegible]3	14,280	-----	85	-----
Same (pillar of 1 heading, between 27 and 28 rooms 2,700 feet southwest of shaft).	W19,737	A	1	3.3	16.3	74.7	5.7	1.1	-----	-----	-----	-----	-----	8,000	14,400	-----	85	-----
Same (composite of samples W19,697, W19,700, W19,702 and W19,737).	12,211	A	1	1.8	16.8	75.4	6.0	.8	4.6	83.4	1.3	3.9	-----	8,078	14,5[illegible]0	-----	85	-----
			2	-----	17.1	76.8	6.1	.9	4.4	85.0	1.3	2.3	-----	8,228	14,810	-----	-----	-----
			3	-----	18.3	81.7	-----	.9	4.7	90.5	1.4	2.5	-----	8,767	15,780	-----	-----	-----
1 mile south of; Pennsylvania No. 2 mine, Lower Kittanning bed (face of 19 heading, 4,100 feet northeast of mine mouth).	W19,695	A	1	2.8	16.2	74.0	7.0	1.5	-----	-----	-----	-----	-----	7,961	14,330	-----	85	-----
Same (pillar between 14 and 15 rooms, 4 main heading, 2,900 feet northwest of mine mouth).	W19,696	A	1	2.4	16.6	74.3	6.7	1.1	-----	-----	-----	-----	-----	7,978	14,300	-----	85	-----
Same (pillar between 2 and 3 rooms, 17 butt entry, 3,900 feet north of mine mouth).	W19,698	A	1	2.8	16.4	75.6	5.2	.9	-----	-----	-----	-----	-----	8,083	14,550	-----	85	-----
Same (pillar between 1 and 2 rooms, 16 butt entry, 3,900 feet north of mine mouth).	W19,699	A	1	2.7	16.2	75.8	5.3	.8	-----	-----	-----	-----	-----	8,078	14,540	-----	85	-----
Same (pillar between 21 and 22 rooms, 5 heading, 3,200 feet north of mine mouth).	W19,701	A	1	2.3	16.8	74.7	6.2	1.3	-----	-----	-----	-----	-----	8,083	14,550	-----	85	-----
Same (composite of samples W19,695, W19,696, W19,698, W19,699 and W19,701).	12,222	A	1	1.6	16.1	76.3	6.0	1.1	4.6	83.8	1.3	3.2	-----	8,105	14,590	-----	85	-----
			2	-----	16.4	77.5	6.1	1.1	4.5	85.1	1.3	1.9	-----	8,233	14,820	-----	-----	-----
			3	-----	17.5	82.5	-----	1.2	4.8	90.6	1.4	2.0	-----	8,767	15,780	-----	-----	-----
1 mile southwest of; Wilmore No. 1 mine, Upper Freeport bed (pillar of 10 room, 5 right entry, 1 slope, 1,575 feet northwest of mine mouth).	20,274	A	1	3.9	18.7	70.5	6.9	1.8	-----	-----	-----	-----	3.1	7,778	14,000	2,350	123	-----
Same (pillar of 4 right entry, 300 feet from 2 slope, 1,500 feet southeast of mine mouth).	20,275	A	1	3.0	21.7	68.9	6.4	2.1	-----	-----	-----	-----	2.4	7,839	14,110	2,170	123	-----
Same (face of 1 room, 4 right entry, 1 slope, 2,250 feet northwest of mine mouth).	20,276	A	1	3.0	19.2	71.0	6.8	1.2	-----	-----	-----	-----	2.4	7,844	14,120	2,470	123	-----
Same (pillar of 6 room, 3 left entry, 2 slope, 2,300 feet northwest of mine mouth).	20,281	A	1	3.2	21.4	68.8	6.6	2.4	-----	-----	-----	-----	2.7	7,828	14,0[illegible]0	2,270	123	-----
Same (pillar of 10 room, 4 left entry, 2 slope, 2,850 feet northwest of mine mouth).	20,282	A	1	3.8	21.1	68.9	6.2	2.4	-----	-----	-----	-----	3.2	7,811	14,060	2,140	123	-----
Same (composite of samples 20,274, 20,275, 20,281 and 20,282).	20,283	A	1	3.5	20.5	69.4	6.6	2.1	4.9	80.0	1.5	4.9	2.9	7,811	14,060	-----	123	-----
			2	-----	21.3	71.8	6.9	2.2	4.6	82.8	1.5	2.0	-----	8,094	14,570	-----	-----	-----
			3	-----	22.8	77.2	-----	2.4	5.0	88.9	1.6	2.1	-----	8,689	15,640	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Ultimate. Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
½ mile northeast of; Wilmore No. 3 mine, Upper Freeport bed (120 feet from face of old slope, opposite 8 right heading, 3,040 feet northwest of mine mouth).	20,273	A	1	3.6	19.6	68.5	8.3	3.1	-----	-----	-----	-----	3.0	7,678	13,820	2,200	123	-----
Same (15 feet from face of 1 left entry, main slope, 1,650 feet northwest of mine mouth).	20,277	A	1	4.5	19.4	67.5	8.6	3.2	-----	-----	-----	-----	4.1	7,567	13,620	1,990	123	-----
Same (20 feet from face of new slope, 1,950 feet north of mine mouth).	20,278	A	1	4.2	18.6	71.8	5.4	1.1	-----	-----	-----	-----	3.7	7,911	14,240	2,400	123	-----
Same (5 feet from face of 6 room, 1 right entry, new slope, 1,600 feet northeast of mine mouth).	20,279	A	1	4.3	20.0	70.1	5.6	1.3	-----	-----	-----	-----	3.8	7,856	14,140	2,490	123	-----
Same (composite of samples 20,273, 20,277 to 20,279 inclusive).	20,280	A	1	4.1	19.0	69.9	7.0	2.2	4.8	79.1	1.4	5.5	3.6	7,750	13,950	-----	123	-----
			2	-----	19.9	72.8	7.3	2.3	4.5	82.5	1.5	1.19	-----	8,083	14,550	-----	-----	-----
			3	-----	21.4	78.6	-----	2.5	4.9	89.0	1.6	2.0	-----	8,722	15,700	-----	-----	-----
Cassandra, 1 mile east of; Hughes No. 2 mine Lower Kittanning bed (face of C heading).	W69,573	A	1	3.8	17.8	71.5	6.9	.6	-----	-----	-----	-----	-----	7,722	13,900	-----	193	-----
			2	-----	18.5	74.3	7.2	.6	-----	-----	-----	-----	-----	8,028	14,450	-----	-----	-----
Same (face of S-65 room, main slope entry).	W69,574	A	1	2.3	17.7	74.1	5.9	.8	-----	-----	-----	-----	-----	7,956	14,320	-----	193	-----
			2	-----	18.1	75.9	6.0	.9	-----	-----	-----	-----	-----	8,144	14,660	-----	-----	-----
Same (face of F heading).	W69,575	A	1	4.0	18.0	71.5	6.5	.9	-----	-----	-----	-----	-----	7,772	13,990	-----	193	-----
			2	-----	18.7	74.5	6.8	.9	-----	-----	-----	-----	-----	8,004	14,570	-----	-----	-----
Carrolton Road, ¼ mile west of; Logan No. 5 mine, Lower Kittanning bed (in 1 main heading, 4,300 feet south of mine mouth).	W20,364	A	1	2.2	19.8	71.7	6.3	1.0	-----	-----	-----	-----	-----	7,972	14,350	-----	85	-----
Same (face of 2 right entry, 250 feet from 2 main heading, 3,750 feet south mine mouth).	W20,365	A	1	2.2	22.4	68.6	6.8	1.2	-----	-----	-----	-----	-----	7,922	14,260	-----	85	-----
Same (face of 8 room, aircourse of 1 right entry, 2 main entry, 4,300 feet south of mine mouth).	W20,366	A	1	1.6	22.7	68.6	7.1	1.2	-----	-----	-----	-----	-----	7,939	14,290	-----	85	-----
Same (face of 2 main heading, 3,600 feet southeast of mine mouth)	W20,367	A	1	2.2	23.0	67.8	7.0	1.4	-----	-----	-----	-----	-----	7,989	14,380	-----	85	-----
Same (face of 4 left heading, 2 main heading, 3,200 feet southeast of mine mouth).	W20,368	A	1	2.0	22.4	70.0	5.6	1.3	-----	-----	-----	-----	-----	8,078	14,540	-----	85	-----

Same (composite of samples W20,364 to W20,368 inclusive).	12,370	A	1	.9	23.1	69.3	6.7	1.3	4.8	81.6	1.3	4.3		8,050	14,490		85	
			2		23.3	70.0	6.7	1.3	4.8	82.4	1.3	3.5		8,122	14,620			
			3		25.0	75.0		1.4	5.1	88.4	1.4	3.7		8,711	15,680			
Colver; Colver mine, Lower Kittanning bed (face of A main entry, 2,400 feet southwest of borehole).	13,634	A	1	2.2*	22.0	69.2	6.6	1.8					1.1	8,000	14,400	2,450	85	
Same (face of A-2 entry, 1,175 feet southeast of borehole 25).	13,635	A	1	2.0*	20.8	71.2	6.0	1.0					.7	8,067	14,520	3,010	85	
Same (face of A-3 entry, 1,400 feet south of borehole 25)	13,636	A	1	2.0*	21.9	68.8	7.3	1.4					.8	7,939	14,290	2,730	85	
Same (face of main heading, 1,200 feet southeast of borehole 25).	13,637	A	1	2.8*	20.6	71.7	4.9	.9					1.1	8,106	14,590	2,730	85	
Same (face of B-1 entry, 725 feet southeast of borehole 25).	13,638	A	1	2.2*	20.7	72.0	5.1	1.0					.9	8,128	14,630	2,680	85	
Same (face of A-1 entry, 950 feet southeast of borehole 25).	13,639	A	1	1.9*	20.9	71.8	5.4	1.0					.7	8,122	14,620	3,010	85	
Same (composite of samples 13,634 to 13,639 inclusive).	13,640	A	1	2.0	21.2	70.9	5.9	1.2	4.6	81.6	1.6	5.1	.9	8,061	14,510		85	
			2		21.6	72.3	6.1	1.3	4.5	83.2	1.6	3.3		8,228	14,810			
			3		23.0	77.0		1.3	4.8	88.6	1.7	3.6		8,756	15,760			
Same (duplicate of 13,639)	13,641	A	1	1.9†	20.9	72.0	5.2	1.0					1.5			3,010	85	
Same (duplicate of 13,638)	13,642	A	1	3.3†	20.0	71.5	5.2	1.1					2.8			2,910	85	
Same (duplicate of 13,637)	13,643	A	1	4.7†	19.7	70.9	4.7	.9					4.2			2,850	85	
Cresson; Cresson No. 9-B mine, Lower Kittanning bed (right rib, 1 dip, near main aircourse).	84,135	A	1	1.9	22.5	68.8	6.8	.7					1.7	7,846	14,120	2,730		156
Same (face of 6 room, 1-A heading in room-neck)	84,136	A	1	2.0	21.8	66.2	10.0	.6					1.7	7,577	13,640	2,730		
Same (composite of samples 84,135 and 84,136)	84,249	A	1	2.0	22.1	67.7	8.2	.7	4.7	79.2	1.4	5.8	1.7	7,717	13,890			
			2		22.6	69.1	8.3	.7	4.6	80.8	1.4	4.2		7,874	14,170			
			3		24.6	75.4		.8	5.0	88.1	1.5	4.6		8,589	15,460			
Dale (near Johnstown); Dale mine, Upper Kittanning bed)	3,836	B	1	2.6	14.1	72.0	11.3	2.8					2.0				22	
East Conemaugh; Upper Freeport bed, Conemaugh slope (coke yard).	3,825	B	1	2.7	14.9	72.3	10.1	2.1					2.0				22	
Dunlo; Yellow Run mine, Lower Kittanning bed (face of 36½ room, 8 right heading).	W69,439	A	1	1.7	17.5	74.9	5.9	.6						8,039	14,470		193	
			2		17.8	76.2	6.0	.6						8,178	14,720			
Same (53 stump, 4 right heading)	W69,440	A	1	1.5	18.8	74.3	5.4	.5						8,072	14,530		193	
			2		19.1	75.4	5.5	.6						8,194	14,750			
Same (face of 8 left entry)	W69,441	A	1	2.1	18.2	72.3	7.4	2.5						7,844	14,120		193	
			2		18.6	73.8	7.6	2.5						8,017	14,430			
Same (face of 10 right entry)	W69,442	A	1	3.0	16.1	75.9	5.0	.7						7,983	14,370		193	
			2		16.6	78.2	5.2	.8						8,233	14,820			
1 mile south of; Henriette mine, Lower Kittanning bed (rib of 2 room, 1 right heading, 2 slope, 700 feet north of No. 2 shaft).	14,238	A	1	2.3	18.7	74.3	4.7	.6					1.3			3,010	85	
Same (junction of 6 slant and main heading, on curve, 3,050 feet north of No. 2 shaft).	14,239	A	1	2.6	18.6	73.8	5.0	.8					1.4			3,010	85	
Same (rib of pillar of 6 left entry, near 13 room, north of rock fault, 4,350 feet northwest of No. 2 shaft).	14,240	A	1	3.0	17.5	74.9	4.6	.6					1.9			3,010	85	
Same (pillar of 6 left heading, 450 feet north of back heading, 2 slope, 4,150 feet northwest of No. 2 shaft).	14,241	A	1	2.8	17.4	75.2	4.6	.7					1.8			3,010	85	

*, †, ‡, §, ¶, See footnote page 17.
*Sample air-dried a few hours only; does not represent the total moisture as received.
†Sample air-dried usual length of time, and represents true moisture "as received".

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (rib between 1 and 2 rooms, 1 level above main entry, 1,500 feet northwest of No. 2 shaft).	14,242	A	1	2.8	18.4	74.3	4.5	.6	-----	-----	-----	-----	1.8	-----	-----	3,010	85	-----
Same (composite of samples 14,238 to 14,242 inclusive).	14,243	A	1	2.7	18.1	74.6	4.6	.6	4.6	83.8	1.4	5.0	1.6	8,089	14,560	-----	85	-----
			2	-----	18.6	76.6	4.8	.6	4.4	86.1	1.4	2.7	-----	8,311	14,960	-----	-----	-----
			3	-----	19.5	80.5	-----	.7	4.6	90.4	1.5	2.8	-----	8,722	15,700	-----	-----	-----
Same (position and bed same as sample 14,240, 2 inches of top coal or bone).	14,244	A	1	2.8	17.1	75.2	4.9	.5	-----	-----	-----	-----	1.7	-----	-----	-----	85	-----
Same (position and bed same as sample 14,238, 4 inches of top coal or bone).	14,245	A	1	2.4	19.1	74.9	3.6	.6	-----	-----	-----	-----	1.5	-----	-----	-----	85	-----
Same (position and bed as sample 14,239, 3 inches of top coal or bone).	14,246	A	1	1.8	18.6	69.7	9.9	2.1	-----	-----	-----	-----	.8	-----	-----	-----	85	-----
Ehrenfeld; Stineman No. 3 mine, Lower Kittanning bed (23 left entry, 2¼ miles from mine mouth).	2,014	A	1	3.5	16.1	74.7	5.7	1.0	-----	-----	-----	-----	2.8	8,067	14,520	-----	22	-----
			2	-----	16.7	77.4	5.9	1.0	-----	-----	-----	-----	-----	8,356	15,040	-----	-----	-----
Same (face of main entry, 2¾ miles from mine mouth).	2,015	A	1	3.1	16.7	74.7	5.5	1.2	-----	-----	-----	-----	2.2	-----	-----	-----	22	-----
Elmora, near; Peerless No. 1 mine, Lower Kittanning bed (heading stump, 3 left entry, main entry, 1,700 feet northeast of mine mouth).	12,134	A	1	3.2	20.9	69.7	6.2	2.0	-----	-----	-----	-----	2.6	7,939	14,290	2,380	85	-----
Same (face of 1 room, 8 right heading, main entry, 2,300 feet east of mine mouth).	12,135	A	1	3.6	21.4	68.0	7.0	1.3	-----	-----	-----	-----	2.9	7,839	14,110	2,720	85	-----
Same (face of 7 left heading, main entry, 2,800 feet northeast of mine mouth).	12,136	A	1	3.3	21.1	69.1	6.5	1.4	-----	-----	-----	-----	2.5	7,956	14,320	2,490	85	-----
Same (rib of 1 room, 3 right heading, main heading, 1,600 feet southeast of mine mouth).	12,137	A	1	3.6	20.4	68.8	7.2	2.0	-----	-----	-----	-----	2.7	7,878	14,180	2,470	85	-----
Same (425 feet in 1 heading, main entry) -----	12,138	A	1	3.9	20.9	69.2	6.0	.9	-----	-----	-----	-----	3.3	7,811	14,060	3,010	85	-----
Same (composite of samples 12,134 to 12,138 inclusive).	12,139	A	1	3.5	20.7	69.4	6.4	1.6	4.9	80.0	1.4	5.7	2.8	7,872	14,170	-----	85	-----
			2	-----	21.5	71.9	6.6	1.6	4.7	82.9	1.4	2.8	-----	8,156	14,680	-----	-----	-----
			3	-----	23.0	77.0	-----	1.7	5.0	88.8	1.5	3.0	-----	8,739	15,730	-----	-----	-----
Emeigh; Victor No. 15 mine, Lower Freeport bed (face of heading).	7,970	B	1	5.5	22.4	65.2	6.9	1.2	5.1	77.2	1.2	8.4	4.7	7,583	13,650	-----	22	-----
			2	-----	23.7	69.0	7.3	1.2	4.8	81.7	1.3	3.7	-----	8,022	14,440	-----	-----	-----
			3	-----	25.6	74.4	-----	1.3	5.2	88.1	1.4	4.0	-----	8,656	15,580	-----	-----	-----
Same -----	7,968	A	1	3.1	21.9	67.6	7.4	.8	-----	-----	-----	-----	2.3	7,789	14,000	-----	22	-----
			2	-----	22.6	69.7	7.7	.8	-----	-----	-----	-----	-----	8,038	14,470	-----	-----	-----

Expedite, (Twin Rocks); near Big Bend, Nonpareil No. 1 mine, Lower Kittanning bed).	3,809	B	1	3.5	18.8	71.1	6.6	2.0					3.0				22	
No. 3 mine, Lower Kittanning bed (face of 4 right heading).	3,810	B	1	3.1	17.6	72.9	6.4	1.4					2.5				22	
Fallen Timber; Peerless No. 4 mine, Upper Freeport bed (face of right main entry, 1,250 feet from mine mouth).	10,278	A	1	3.5	24.5	61.4	10.6	1.8					2.5	7,478	13,460	2,270	22	
Same (face of left main entry, 1,200 feet from mine mouth).	10,279	A	1	3.3	24.8	63.1	8.8	1.6					2.7	7,678	13,820	2,330	22	
Same (composite of samples 10,278 and 10,279)	10,298	A	1	3.3	24.1	62.7	9.9	1.8	5.0	76.8	1.3	5.2	2.6	7,567	13,620		22	
			2		24.9	64.9	10.2	1.9	4.8	79.4	1.3	2.4		7,828	14,090			
			3		27.7	72.3		2.1	5.3	88.5	1.4	2.7		8,717	15,690			
Figart, 1¼ miles northeast of; Frick No. 2 mine, Kittanning bed (face of 2 main heading, 400 feet from mouth of main entry).	W20,433	A	1	2.2	24.6	64.2	9.0	1.2						7,694	13,850		85	
Same (face of 1 entry, 2 main entry, 400 feet from mouth of main entry).	W20,434	A	1	2.4	23.2	64.5	9.9	1.4						7,617	13,710		85	
Same (face of 5 room, main left heading, 850 feet from mouth of main entry).	W20,474	A	1	2.6	24.1	66.6	6.7	1.0						7,861	14,150		85	
Same (face of 1 left heading, 500 feet from mouth of main entry).	W20,475	A	1	2.9	23.4	65.2	8.5	1.0						7,694	13,850		85	
Same (face of straight main heading, 1,200 feet from mouth of main entry).	W20,476	A	1	2.6	23.9	67.3	6.2	.9						7,917	14,250		85	
Same (composite of samples W20,433, W20,434, W20,474 to W20,476 inclusive).	12,366	A	1	1.1	25.7	65.0	8.2	1.2	4.7	79.7	1.3	4.9		7,817	14,070		85	
			2		26.0	65.7	8.3	1.2	4.7	80.6	1.3	3.9		7,906	14,230			
			3		28.3	71.7		1.3	5.1	87.9	1.4	4.3		8,622	15,520			
Franklin; Franklin Slope No. 2 mine, Lower Kittanning bed.	3,840	B	1	2.7	15.6	74.1	7.6	1.9					1.8				22	
Franklin No. 1 mine, Upper Kittanning bed	3,841	B	1	1.7	18.5	69.1	10.7	3.5					1.0				22	
Gallitzin; Gallitzin Shaft mine, Upper Freeport bed (on rib, 20 room, 10 right entry, 70 feet from entry).	30,824	A	1	2.6	26.4	64.5	6.5	1.4					1.7	7,906	14,230	2,390	193	
Same (on rib, 55 room, 12 left entry, 200 feet from entry).	30,825	A	1	2.7	25.8	65.4	6.1	1.4					1.8	7,933	14,280	2,370	193	
Same (on rib, 5 room, 1 dip on motor road, 60 feet from entry).	30,826	A	1	2.9	26.3	65.2	5.6	1.3					1.9	7,967	14,340	2,300	193	
Same (on rib, 65 room, 9 right entry, 20 feet from entry).	30,827	A	1	2.8	26.5	64.5	6.2	1.5					2.1	7,889	14,200	2,280	193	
Same (composite of samples 30,824 to 30,827 inclusive.)	30,828	A	1	2.7	26.0	65.1	6.2	1.4	5.0	80.4	1.5	5.5	1.9	7,978	14,270		193	
			2		26.8	66.8	6.4	1.4	4.8	82.6	1.5	3.3		8,150	14,670			
			3		28.6	71.4		1.5	5.1	88.2	1.6	3.6		8,706	15,670			
Hastings; No. 20 mine, Lower Freeport bed (19 room, 29 left heading, several hundred feet from opening).	4,028	A	1	2.9	22.6	67.7	6.8	1.4					2.3				22	
Same (24 right heading)	4,029	A	1	2.7	22.7	67.4	7.2	1.5					2.3	7,856	14,140		22	
			2		23.3	69.3	7.4	1.6						8,078	14,510			
2⅔ miles northeast of; Miller Run mine, Lower Kittanning bed (face of main aircourse, 2,000 feet from mine mouth).	W20,440	A	1	3.0	22.4	66.3	8.3	1.4						7,694	13,850		85	
Same (face of 4 room, 5 right entry, 200 feet from main entry).	W20,441	A	1	2.1	21.9	66.5	9.5	1.8						7,614	13,760		85	

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (face of 1 right entry, 200 feet off 2 left entry).	W20,442	A	1	2.3	22.4	67.0	8.3	.9	----	----	----	----	----	7,806	14,050	----	85	----
Same (face of 2 left entry, 500 feet off main entry).	W20,443	A	1	2.1	23.5	64.7	9.7	1.3	----	----	----	----	----	7,644	13,760	----	85	----
Same (composite of samples W20,440 to W20,443 inclusive).	12,371	A	1	.8	23.9	66.2	9.1	1.4	4.7	79.2	1.3	4.3	----	7,800	14,040	----	85	----
			2	----	24.1	66.7	9.2	1.4	4.6	79.8	1.3	3.7	----	7,867	14,160	----	----	----
			3	----	26.6	73.4	----	1.5	5.1	87.9	1.4	4.1	----	8,661	15.590	----	----	----
Same (pillar of 5 room, 1 left entry, 300 feet off main entry).	W20,447	A	1	2.4	21.0	69.9	6.7	.9	----	----	----	----	----	7,906	14,230	----	85	----
			2	----	21.5	71.6	6.9	.9	----	----	----	----	----	8,094	14,570	----	----	----
1 mile south of; Pennsylvania No. 11 mine, Lower Freeport bed (face of 5 right entry, main heading).	12,150	A	1	2.8	23.5	67.6	6.1	1.2	----	----	----	----	2.2	7,944	14,300	2,640	85	----
Same (face of old main heading)	12,151	A	1	2.8	23.5	66.7	7.0	1.3	----	----	----	----	2.2	7,856	14,140	2,620	85	----
Same (face of 2 right cross heading)	12,166	A	1	2.9	23.9	66.3	6.9	1.3	----	----	----	----	2.2	7,844	14,120	2,580	85	----
Same (face of 3 left heading).	12,167	A	1	3.3	23.5	64.7	8.5	1.7	----	----	----	----	2.7	7.614	13,760	2,430	85	----
Same (composite of samples 12,150, 12,151, 12,166 and 12,167),	12,168	A	1	2.9	23.7	66.3	7.1	1.4	5.0	79.5	1.3	5.7	2.3	7,839	14 110	----	85	----
			2	----	24.4	68.3	7.3	1.4	4.8	81.9	1.3	3.3	----	8,072	14,530	----	----	----
			3	----	26.3	73.7	----	1.5	5.2	88.3	1.5	3.5	----	8,706	15,670	----	----	----
Same (pillar, in 16 room, 3 left entry)	12,169	A	1	3.4	23.2	67.2	6.2	1.6	5.1	79.6	1.3	6.2	2.8	7,839	14.110	2,440	85	----
			2	----	24.0	69.6	6.4	1.7	4.9	82.4	1.3	3.3	----	8,117	14,610	----	----	----
			3	----	25.6	74.4	----	1.8	5.2	88.0	1.4	3.6	----	8 667	15,600	----	----	----
Pennsylvania No. 12 mine, Lower Freeport bed (face of original main heading, 5,800 feet from mine mouth.	12,152	A	1	2.3	25.3	64.5	7.9	2.1	----	----	----	----	1.6	7,778	14,000	2,320	85	----
Same (face of 5 entry, main heading)	12,153	A	1	3.0	22.5	67.5	7.0	2.0	----	----	----	----	2.3	7,828	14,090	2,200	85	----
Same (face of 4 right heading, 1½ miles from mine mouth).	12,154	A	1	2.6	24.1	66.3	7.0	1.6	----	----	----	----	1.9	7,861	14,150	2,400	85	----
Same (face of 1 room, 1 entry, 3 right heading)	12,155	A	1	2.6	23.3	66.1	8.0	1.6	----	----	----	----	2.2	7,750	13,950	2,580	85	----
Same (face of 3 right entry, main heading).	12,156	A	1	2.8	22.5	67.4	7.3	1.7	----	----	----	----	2.1	7.822	14,080	2,420	85	----
Same (composite of samples 12,152 to 12,156 inclusive).	12,157	A	1	2.7	23.6	66.2	7.5	1.8	4.9	78.8	1.3	5.7	2.0	7.800	14,040	----	85	----
			2	----	24.3	68.0	7.7	1.9	4.7	81.0	1.4	3.3	----	8,017	14,430	----	----	----
			3	----	26.3	73.7	----	2.1	5.1	87.8	1.5	3.5	----	8,683	15,630	----	----	----

Johnstown; Ferndale mine, Upper Freeport bed (main bench).	3,843	B	1	2.8	15.6	70.3	11.3	2.4	4.3	76.5	1.2	4.3	2.1	7,483	13,470	-------	22	-----
			2	-----	16.1	72.3	11.6	2.5	4.1	78.7	1.3	1.8	-----	7,700	13,860	-------	-----	-----
			3	-----	18.2	81.8	------	2.8	4.6	89.0	1.4	2.2	-----	8,706	15,670	-------	-----	-----
Greenhill mine, Lower Kittanning bed	3,838	B	1	2.0	14.5	75.3	8.2	2.3	4.1	80.0	1.3	4.1	1.4	7,822	14,080	-------	22	-----
			2	-----	14.8	76.8	8.4	2.3	4.0	81.6	1.3	2.4	-----	7,983	14,370	-------	-----	-----
			3	-----	16.1	83.9	------	2.5	4.4	89.1	1.4	2.6	-----	8,711	15,680	-------	-----	-----
Southeast of; on Solomans Run, Litsinger mine, Upper Kittanning bed.	3,844	B	1	3.5	17.2	60.0	10.3	2.0	-----	------	-----	-----	2.3	-------	-------	-------	22	-----
Rolling Mill mine, Upper Kittanning bed	3,833	B	1	1.9	15.8	70.8	11.5	3.7	-----	------	-----	-----	1.2	-------	-------	-------	22	-----
Stony Creek prospect, near trolley bridge, between Moxhom and Ferndale, Lower Freeport bed	4,012	B	1	4.7	13.8	72.3	9.2	1.1	-----	------	-----	-----	4.0	-------	-------	-------	22	-----
Sunnyside No. 2 mine (at Moxhom), Upper Kittanning bed	3,834	B	1	2.9	13.5	74.1	9.5	1.9	-----	------	-----	-----	2.2	-------	-------	-------	22	-----
1½ miles from; Sunnyside mine, Upper Kittanning bed (face of main entry)	10,249	A	1	5.6	14.0	70.9	9.5	2.3	-----	------	-----	-----	5.1	7,383	13,290	2,320	22	-----
Same (face of 3 left entry)	10,252	A	1	3.2	14.0	72.9	9.9	2.2	-----	------	-----	-----	2.8	7,528	13,550	2,340	22	-----
Same (face of 3 right entry)	10,251	A	1	3.3	14.2	71.6	10.9	2.8	-----	------	-----	-----	2.9	7,406	13,330	2,240	22	-----
Same (face of 1 left entry, 4,800 feet from mine mouth).	10,250	A	1	2.4	14.9	72.9	9.8	2.2	-----	------	-----	-----	2.1	7,611	13,700	2,450	22	-----
Same (composite of samples 10,249 to 10,252 inclusive).	10,270	A	1	3.7	14.5	71.7	10.1	2.4	4.4	77.1	1.2	4.8	3.2	7,467	13,440	-------	22	-----
			2	-----	15.0	74.5	10.5	2.5	4.1	80.1	1.3	1.5	-----	7,756	13,960	-------	-----	-----
			3	-----	16.8	83.2	------	2.7	4.6	89.5	1.4	1.8	-----	8,661	15,590	-------	-----	-----
2 miles south of; Smokeless No. 1 mine, Upper Kittanning bed (face of 2 left entry, main dip entry, 2,200 feet from mine mouth)	22,430	A	1	2.6	15.8	71.5	10.1	2.5	-----	------	-----	-----	2.0	7,506	13,510	2,160	123	-----
Same (face of 2 right entry, main dip entry, 2,850 feet from mine mouth)	22,431	A	1	1.6	17.3	71.9	9.2	1.7	-----	------	-----	-----	1.0	7,711	13,880	2,260	123	-----
Same (face of 2 crosscut, 3 room, 2 right entry, 1,680 feet from mine mouth)	22,432	A	1	2.3	15.9	72.5	9.3	2.2	-----	------	-----	-----	1.6	7,633	13,740	2,210	123	-----
Same (composite of samples 22,430 to 22,432 inclusive)	22,433	A	1	2.2	16.2	72.1	9.5	2.1	4.4	79.2	1.4	3.4	1.5	7,617	13,710	-------	123	-----
			2	-----	16.6	73.7	9.7	2.2	4.2	81.0	1.4	1.5	-----	7,783	14,010	-------	-----	-----
			3	-----	18.4	81.6	------	2.4	4.7	89.7	1.6	1.6	-----	8,617	15,510	-------	-----	-----
3 miles south of; Valley No. 1 mine, Upper Kittanning bed (face of 11 room in Andy's heading, 1,000 feet west or tipple No. 2)	W19,563	A	1	2.0	14.0	73.6	10.4	2.1	-----	------	-----	-----	-----	7,667	13,800	-------	85	-----
Same (face of 21 room, 7 left heading, 3,400 feet southeast of mine mouth)	W19,564	A	1	1.9	14.0	74.8	9.3	2.3	-----	------	-----	-----	-----	7,733	13,920	-------	85	-----
Same (face of 4 room, 8 right head'ng, 3,600 feet southeast of mine mouth)	W19,566	A	1	1.8	14.5	76.2	7.5	.7	-----	------	-----	-----	-----	7,950	14,310	-------	85	-----
Same (rib of main aircourse, 150 feet beyond 12 right heading)	W19,567	A	1	2.4	14.4	75.3	7.9	1.0	-----	------	-----	-----	-----	7,861	14,150	-------	85	-----
Same (composite of samples W19,563, W19,564, W19,566 and W19,567)	12,213	A	1	1.3	14.6	75.3	8.8	1.6	4.3	81.2	1.4	2.7	-----	7,806	14,050	-------	85	-----
			2	-----	14.8	76.3	8.9	1.6	4.2	82.3	1.4	1.5	-----	7,911	14,240	-------	-----	-----
			3	-----	16.3	83.7	------	1.8	4.6	90.4	1.6	1.6	-----	8,683	15,630	-------	-----	-----
Same (chain pillar, 4,200 feet northeast of mine mouth)	W19,565	A	1	2.3	14.3	74.6	8.8	2.5	-----	------	-----	-----	-----	7,739	13,930	-------	85	-----
			2	-----	14.6	76.4	9.0	2.5	-----	------	-----	-----	-----	7,922	14,260	-------	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Lilly; Sonman No. 2 mine, Lower Kittanning bed (face of 26 room, 7 left entry, 5,500 feet west of mine mouth)	10,325	A	1	3.4	17.5	73.2	5.9	.6	-----	-----	-----	-----	2.7	7,911	14,240	3,010	22	-----
Same (face of 9 room, 3 right entry, 5,000 feet north of mine mouth)	10,326	A	1	9.0	16.7	68.6	5.7	.6	-----	-----	-----	-----	8.2	7,461	13,430	3,010	22	-----
Same (composite of samples 10,325 and 10,326) ---	10,328	A	1	6.1	18.8	69.2	5.9	.6	5.1	79.2	1.3	7.9	5.5	7,683	13,830	-----	22	-----
			2	-----	20.0	73.8	6.2	.6	4.7	84.4	1.4	2.7	-----	8,178	14,720	-----	-----	-----
			3	-----	21.4	78.6	-----	.7	5.0	90.0	1.5	2.8	-----	8,722	15,700	-----	-----	-----
Same (pillar in 6 room, 2 right entry, 4,200 feet north of mine mouth)	10,327	A	1	4.8	17.4	71.4	6.4	.7	-----	-----	-----	-----	3.8	7,767	13,980	3,010	22	-----
			2	-----	18.3	75.0	6.7	.7	-----	-----	-----	-----	-----	8,156	14,680	-----	-----	-----
Llanfair, 1 mile south of; Scalp Level No. 2 mine, Lower Kittanning bed (rib of main car return entry, connecting air and hoisting shafts, 160 feet northeast of air shaft)	20,299	A	1	2.5	18.9	74.1	4.5	.8	-----	-----	-----	-----	2.1	8,167	14,700	3,010	123	-----
Same (south rib, 110 feet from face of 1 east entry, 240 feet southeast of air shaft)	20,413	A	1	2.0	20.9	72.6	4.5	.7	-----	-----	-----	-----	1.6	8,183	14,730	3,010	123	-----
Same (north rib, 15 feet from face of drift driven to connect with old workings, 110 feet northwest of air shaft.	20,414	A	1	3.0	18.8	73.1	5.1	.7	-----	-----	-----	-----	2.6	8,039	14,470	3,010	123	-----
Same (face of loaded track haulway, 90 feet northwest of air shaft)	20,415	A	1	2.8	18.9	73.2	5.1	.7	-----	-----	-----	-----	2.3	8,044	14,480	2,960	123	-----
Same (composite of samples 20,299, 20,413 to 20,415 inclusive	20,416	A	1	2.7	19.4	73.0	4.9	.7	4.7	83.8	1.3	4.6	2.1	8,106	14,590	-----	123	-----
			2	-----	19.9	75.0	5.1	.7	4.5	86.2	1.4	2.1	-----	8,328	14,990	-----	-----	-----
			3	-----	21.0	79.0	-----	.8	4.8	90.8	1.4	2.2	-----	8,778	15,800	-----	-----	-----
Lloydell; Cambria mine, Lower Kittanning bed (face of 10 room, 3 left heading, 2,500 feet south of mine mouth)	4,347	A	1	2.4	17.8	73.2	6.6	1.3	-----	-----	-----	-----	1.9	-----	-----	-----	22	-----
Same (face of 5 left heading, 3,200 feet south of mine mouth)	4,348	A	1	2.7	17.6	71.1	8.6	3.0	-----	-----	-----	-----	2.2	7,778	14,000	-----	22	-----
			2	-----	18.1	73.1	8.8	3.1	-----	-----	-----	-----	-----	7,989	14,380	-----	-----	-----
Nanty Glo; No. 14 mine, Lower Kittanning bed ----	3,855	B	1	2.8	17.8	73.1	6.3	1.9	-----	-----	-----	-----	2.1	-----	-----	-----	22	-----
½ mile east of; Springfield No. 3 mine, Lower Kittanning bed (face of main B heading)	W69,625	A	1	2.2	20.5	69.3	8.0	2.0	-----	-----	-----	-----	-----	7,806	14,050	-----	193	-----
			2	-----	21.0	70.8	8.2	2.1	-----	-----	-----	-----	-----	7,983	14,370	-----	-----	-----

Same (face of main C heading)	W69,626	A	1	2.4	19.2	72.1	6.3	2.0	----	----	----	----	----	7,967	14,340	----	193	----
			2	----	19.7	73.8	6.5	2.1	----	----	----	----	----	8,156	14,680	----	----	----
½ mile southeast of; Springfield No. 1 mine, Lower Kittanning bed (face of 4 left entry, 2,700 feet from mine mouth)	12,128	A	1	3.3	17.7	71.9	7.1	2.0	----	----	----	----	2.8	7,839	14,110	2,190	85	----
Same (face of main entry, 3,500 feet from mine mouth)	12,129	A	1	4.3	16.6	72.5	6.6	2.3	----	----	----	----	3.7	7,794	14,030	2,080	85	----
Same (face of 3 crosscut, dip heading, 2,500 feet from mine mouth)	12,130	A	1	3.1	17.1	73.3	6.5	2.4	----	----	----	----	2.5	7,900	14,220	2,260	85	----
Same (face of 2 left entry, 3,000 feet from mine mouth)	12,131	A	1	3.0	20.8	69.9	6.3	1.9	----	----	----	----	2.4	7,928	14,270	2,280	85	----
Same (composite of samples 12,128 to 12,131 inclusive)	12,132	A	1	3.5	18.0	71.7	6.8	2.2	4.7	80.1	1.2	5.0	2.9	7,856	14,140	----	85	----
			2	----	18.6	74.3	7.1	2.3	4.5	83.0	1.2	1.9	----	8,139	14,650	----	----	----
			3	----	20.0	80.0	----	2.5	4.9	89.3	1.3	2.0	----	8,761	15,770	----	----	----
Same (pillar in 3 room, 2 left entry)	12,133	A	1	3.2	17.2	73.8	5.8	2.0	4.8	81.3	1.2	4.9	2.5	7,989	14,380	2,220	85	----
			2	----	17.8	76.2	6.0	2.0	4.6	84.0	1.3	2.1	----	8,256	14,860	----	----	----
			3	----	18.9	81.1	----	2.2	4.9	89.3	1.3	2.3	----	8,778	15,800	----	----	----
Same (face of 9 room, 9 left heading, 4,700 feet from mine mouth)	W46,483	A	1	2.5	19.4	72.1	6.0	1.8	----	----	----	----	----	7,967	14,340	----	123	----
Same (rib in 12 room, 8 left heading, 4,400 feet from mine mouth)	W46,484	A	1	3.2	19.6	71.4	5.8	2.0	----	----	----	----	----	7,911	14,240	----	123	----
Same (face of 6 room, 7 slant heading, 7 left heading, 5,000 feet from mine mouth)	W46,486	A	1	2.4	20.0	71.1	6.5	2.2	----	----	----	----	----	7,933	14,280	----	123	----
Same (300 feet off 9 left heading, parallel with main heading, 4,600 feet from mine mouth)	W46,487	A	1	2.4	20.6	71.1	5.9	1.6	----	----	----	----	----	7,989	14,380	----	123	----
Same (15 feet from face of 4 left heading, main heading, 5,100 feet from mine mouth)	W46,488	A	1	2.5	19.5	71.7	6.3	2.3	----	----	----	----	----	7,911	14,220	----	123	----
Same (100 feet on rib from face of 7 left heading, 5,200 feet from mine mouth)	W46,489	A	1	2.6	19.4	70.5	7.5	3.2	----	----	----	----	----	7,806	14,050	----	123	----
Same (face of 30 room, 3 left heading, main heading, 4,700 feet from mine mouth)	W46,490	A	1	2.3	20.4	70.9	6.4	2.1	----	----	----	----	----	7,950	14,310	----	123	----
Same (composite of samples W46,483, W46,484, W46,486 to W46,490 inclusive)	19,579	A	1	2.5	19.9	71.2	6.4	2.1	4.7	81.2	1.3	4.3	----	7,956	14,320	----	123	----
			2	----	20.4	73.0	6.6	2.2	4.5	83.3	1.4	2.0	----	8,161	14,690	----	----	----
			3	----	21.8	78.2	----	2.3	4.9	89.1	1.5	2.2	----	8,733	15,720	----	----	----
Same (face of 7 left entry)	W69,612	A	1	2.2	19.1	72.9	5.8	1.5	----	----	----	----	----	8,028	14,450	----	193	----
Same (face of main dip entry)	W69,614	A	1	2.9	18.1	73.0	6.0	1.8	----	----	----	----	----	7,933	14,280	----	193	----
Same (face of main heading)	W69,616	A	1	2.0	19.6	73.1	5.3	1.4	----	----	----	----	----	8,078	14,540	----	193	----
Same (pillar, 1 room, 4 heading)	W69,618	A	1	1.6	18.0	70.7	9.7	3.8	----	----	----	----	----	7,767	13,980	----	193	----
1 mile northeast of; Lincoln No. 1 mine, Lower Kittanning bed (face of new main heading)	12,180	A	1	3.0	19.4	71.2	6.4	1.8	----	----	----	----	2.4	7,939	14,290	2,360	85	----
Same (face of 2 right entry)	12,181	A	1	3.3	18.0	72.2	6.5	1.7	----	----	----	----	2.6	7,900	14,220	2,370	85	----
Same (face of 4 right entry)	12,182	A	1	2.8	19.6	71.5	6.1	1.7	----	----	----	----	2.4	7,978	14,360	2,240	85	----
Same (face of 7 left entry)	12,183	A	1	2.9	19.7	71.4	6.0	1.6	----	----	----	----	2.5	7,972	14,350	2,430	85	----
Same (face of 9 left entry)	12,184	A	1	2.7	19.1	71.2	7.0	2.2	----	----	----	----	2.3	7,883	14,190	2,340	85	----
Same (composite of samples 12,180 to 12,184 inclusive)	12,185	A	1	2.8	19.8	70.9	6.5	1.9	4.9	80.8	1.3	4.6	2.4	7,939	14,290	----	85	----
			2	----	20.4	72.9	6.7	1.9	4.7	83.2	1.4	2.1	----	8,167	14,700	----	----	----
			3	----	21.8	78.2	----	2.0	5.0	89.2	1.5	2.3	----	8,756	15,760	----	----	----
Same (rib, 25 feet from face of new main entry, 5,400 feet northeast of mine mouth)	22,514	A	1	3.4	20.1	69.4	7.1	1.8	----	----	----	----	2.8	7,822	14,080	2,430	123	----
Same (face of 7 right heading, new main entry, 4,800 feet northeast of mine mouth)	22,515	A	1	3.1	20.2	70.9	5.8	1.5	----	----	----	----	2.5	8,011	14,420	2,460	123	----

*, †, ‡, §, ¶. See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (rib next to face, 12 room, 20 feet off 4 left heading, 4 right entry, 5250 feet northeast of mine mouth).	22,516	A	1	3.7	19.8	69.6	6.9	2.2	-----	-----	-----	-----	3.1	7,839	14,110	2,160	123	-----
Same (9 back heading stump, 150 feet off hill entry, 5,100 feet northeast of mine mouth).	22,517	A	1	2.7	21.0	70.0	6.3	1.9	-----	-----	-----	-----	2.1	7,961	14,330	2,270	123	-----
Same (face of McFadden G heading, 3,800 feet northeast of mine mouth).	22,518	A	1	3.7	21.0	69.9	5.4	1.4	-----	-----	-----	-----	3.1	7,956	14,320	2,480	123	-----
Same (face of 7 room, 100 feet off McFadden F heading, 3,100 feet northeast of mine mouth).	22,519	A	1	3.1	20.5	70.8	5.6	1.6	-----	-----	-----	-----	2.6	8,000	14,400	2,420	123	-----
Same (composite of samples 22,514 to 22,519 inclusive).	22,520	A	1	3.3	20.5	70.0	6.2	1.8	4.9	80.7	1.1	5.3	2.7	7,950	14,310	-----	123	-----
			2	-----	21.2	72.4	6.4	1.8	4.7	83.4	1.2	2.5	-----	8,217	14,790	-----	-----	-----
			3	-----	22.6	77.4	-----	1.9	5.1	89.1	1.3	2.6	-----	8,783	15,810	-----	-----	-----
2-2/10 miles north of; Cardiff No. 1 mine, Lower Kittanning bed (face of main entry, 4,000 feet from mine mouth).	381	A	1	1.9	20.1	72.0	6.0	1.8	-----	-----	-----	-----	-----	8,089	14,560	-----	22	-----
Same (face of 7 left entry, 2,800 feet from mine mouth).	382	A	1	1.8	19.9	70.1	8.2	2.6	-----	-----	-----	-----	-----	7,878	14,180	-----	22	-----
Same (face of 6 right entry, 2,100 feet from mine mouth).	383	A	1	2.3	20.9	71.1	5.7	1.7	-----	-----	-----	-----	-----	8,100	14,580	-----	22	-----
Same (face of 5 left entry, 1,800 feet from mine mouth).	384	A	1	2.9	19.9	71.0	6.2	1.7	-----	-----	-----	-----	-----	8,000	14,400	-----	22	-----
Same (composite of samples 381 to 384 inclusive).	10,452	A	1	1.1	20.0	72.1	6.8	2.3	4.7	81.8	1.2	3.2	-----	8,016	14,430	-----	22	-----
			2	-----	20.2	72.9	6.9	2.3	4.7	82.7	1.3	2.1	-----	8,189	14,740	-----	-----	-----
			3	-----	21.7	78.3	-----	2.5	5.0	88.8	1.3	2.4	-----	8,772	15,790	-----	-----	-----
Same (face of 4 room, 12 right entry, main heading).	W69,696	A	1	2.4	21.1	70.2	6.3	1.9	-----	-----	-----	-----	-----	7,928	14,270	-----	193	-----
			2	-----	21.6	72.0	6.4	2.0	-----	-----	-----	-----	-----	8,128	14,630	-----	-----	-----
Same (face of 11 left entry, 14 room, main entry)	W69,697	A	1	2.5	20.0	71.4	6.1	1.9	-----	-----	-----	-----	-----	7,989	14,380	-----	193	-----
			2	-----	20.5	73.3	6.2	2.0	-----	-----	-----	-----	-----	8,194	14,750	-----	-----	-----
Same (face of 3 left entry, main entry).	W69,698	A	1	2.8	20.8	69.9	6.5	1.9	-----	-----	-----	-----	-----	7,883	14,190	-----	193	-----
			2	-----	21.4	71.9	6.7	2.0	-----	-----	-----	-----	-----	8,106	14,590	-----	-----	-----
Same (face of 21 left entry, main entry).	W69,699	A	1	2.7	20.8	70.5	6.0	1.9	-----	-----	-----	-----	-----	7,950	14,310	-----	193	-----
			2	-----	21.4	72.4	6.2	1.9	-----	-----	-----	-----	-----	8,167	14,700	-----	-----	-----

Patton, 1 mile north of; Brown bank, Lower Kittanning bed (300 feet from mine mouth).	7,962	B	1	3.9	22.5	67.1	6.5	.7	5.2	79.4	1.3	6.9	3.1	7,844	14,120	----	22	----
			2	----	23.4	69.8	6.8	.7	4.9	82.6	1.3	3.7	----	8,161	14,690	----	----	----
			3	----	25.1	74.9	----	.7	5.3	88.6	1.4	4.0	----	8,756	15,760	----	----	----
Moshannon No. 33 mine, Upper Kittanning bed (face of 18 heading, 2 main heading).	7,959	B	1	2.7	23.2	65.7	8.4	1.7	5.0	78.4	1.2	5.3	1.9	7,678	13,820	----	22	----
			2	----	23.8	67.6	8.6	1.8	4.8	80.6	1.2	3.0	----	7,894	14,210	----	----	----
			3	----	26.1	73.9	----	1.9	5.2	88.1	1.3	3.5	----	8,633	15,540	----	----	----
Same ----	7,955	B	1	4.0	20.9	61.9	13.2	.9	----	----	----	----	3.0	7,100	12,780	----	22	----
			2	----	21.8	64.5	13.7	.9	----	----	----	----	----	7,394	13,310	----	----	----
Same (face of 21 heading, 1 main heading) ----	7,965	B	1	.9	22.5	59.3	17.3	4.0	----	----	----	----	.4	7,089	12,760	----	22	----
			2	----	22.7	59.8	17.5	4.0	----	----	----	----	----	7,156	12,880	----	----	----
Same (face of 6 left heading, 2 level) ----	7,961	B	1	3.3	22.0	63.0	11.7	3.5	----	----	----	----	2.6	7,328	13,190	----	22	----
			2	----	22.7	65.2	12.1	3.6	----	----	----	----	----	7,578	13,640	----	----	----
Portage, 1 mile southeast of; Miller No. 1 mine, Lower Kittanning bed (face of 1 room, 1 right entry, 1,000 feet from shaft bottom)	10,293	A	1	2.9	16.5	74.6	6.0	.9	----	----	----	----	2.2	7,956	14,320	2,730	22	----
Same (1 left aircourse, 2 right entry, 3,000 feet from shaft bottom)	10,294	A	1	3.1	17.7	73.5	5.7	.7	----	----	----	----	2.5	7,967	14,340	3,010	22	----
Same (face of straight main entry, 4,500 feet from shaft bottom)	10,295	A	1	3.6	16.6	73.3	6.5	1.9	----	----	----	----	3.2	7,822	14,080	[illegible]	22	----
Same (face of 4 east heading, 3,000 feet from shaft bottom).	10,296	A	1	3.8	17.0	74.2	5.0	.6	----	----	----	----	3.2	8,011	14,420	3,010	22	----
Same (face of 1 right entry, 1 left heading, 2,500 feet from shaft botton).	10,297	A	1	3.3	17.4	73.8	5.5	1.1	----	----	----	----	2.8	[illegible]	14,370	2,590	22	----
Same (composite of samples 10,293 to 10,297 inclusive).	10,300	A	1	3.5	17.3	73.3	5.9	1.1	4.8	82.1	1.2	4.9	2.8	[illegible]	[illegible]	----	22	----
			2	----	17.9	76.0	6.1	1.1	4.6	85.1	1.3	1.8	----	8,222	[illegible]	----	----	----
			3	----	19.1	80.9	----	1.2	4.9	90.6	1.4	1.9	----	8,756	15,760	----	----	----
Same (face of 2 right dip, 2,800 feet southwest of shaft bottom).	11,355	A	1	2.9	15.8	76.0	5.3	.7	----	----	----	----	2.4	----	----	3,010	85	----
Same (face of 3 left heading, 4,100 feet southeast of shaft bottom).	11,356	A	1	2.9	17.6	72.7	6.8	1.7	----	----	----	----	2.4	----	----	2,460	85	----
Same (pillar of A-1 heading, 2,000 feet from shaft bottom).	11,357	A	1	1.9	19.8	71.5	6.8	1.5	----	----	----	----	1.4	----	----	3,010	85	----
Same (face of 1 right dip, 1,500 feet from shaft bottom).	11,358	A	1	2.4	17.5	74.0	6.1	.7	----	----	----	----	1.8	----	----	3,010	85	----
Same (face of 1 left heading, 3,000 feet from shaft bottom).	11,359	A	1	3.4	17.7	72.3	6.6	1.4	----	----	----	----	2.9	----	----	2,620	85	----
Same (composite of samples 11,355 to 11,359 inclusive).	11,360	A	1	2.9	17.6	73.2	6.3	1.2	4.5	81.7	1.2	5.1	2.2	7,939	14,290	----	85	----
			2	----	18.2	75.3	6.5	1.3	4.3	84.1	1.3	2.5	----	8,172	14,710	----	----	----
			3	----	19.4	80.6	----	1.4	4.6	89.9	1.4	2.7	----	8,739	15,730	----	----	----
1 mile east of, Sonman No. 2 shaft, Lower Kittanning bed (pillar near face of 23 room, 1 right, plane entry, 3,000 feet southeast of shaft).	W19,689	A	1	2.5	15.3	76.0	6.2	.7	----	----	----	----	----	8,039	[illegible]	----	85	----
Same (face of "No. 32 crook," main north heading).	W19,691	A	1	2.6	16.3	74.6	6.5	1.7	----	----	----	----	----	7,956	14,320	----	85	----
Same (face of "No. 28 crook", 1 left heading, dip heading, main south heading).	W19,692	A	1	2.5	15.9	76.1	5.5	.7	----	----	----	----	----	8,083	14,550	----	85	----
Same (composite of samples W19,689, W19,691 and W19,692).	12,217	A	1	1.4	16.9	75.3	6.4	1.1	4.5	83.4	1.3	3.3	----	8,080	14,560	----	85	----
			2	----	17.2	76.3	6.5	1.1	4.4	84.6	1.3	2.1	----	8,236	14,770	----	----	----
			3	----	18.4	81.6	----	1.2	4.7	90.5	1.4	2.2	----	8,778	14,770	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Ultimate. Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (face of 8 room, 2 left heading, dip heading main south heading).	W19,688	A	1	1.7	16.3	74.4	7.6	.7	----	----	----	----	----	7,933	14,280	----	85	----
Same (face of 13 room, 1 left heading, dip heading main south heading).	W19,690	A	1	2.5	15.4	76.6	5.5	1.2	----	----	----	----	----	8,094	14,570	----	85	----
Same (face of 10 room, 1 right heading, 17 plane, main north heading).	W19,693	A	1	2.2	16.1	75.0	6.7	1.3	----	----	----	----	----	7,978	14,360	----	85	----
Same (face of 3 right heading, main dip heading, main north heading).	W19,694	A	1	4.2	15.4	74.9	5.5	.7	----	----	----	----	----	7,967	14,340	----	85	----
Same (composite of samples W19,688, W19,690, W19,693 and W19,694).	12,205	A	1	1.4	16.0	76.3	6.3	1.0	4.4	83.4	1.2	3.7	----	8,100	14,580	----	85	----
			2	----	16.2	77.4	6.4	1.0	4.3	84.6	1.2	2.5	----	8,217	14,790	----	----	----
			3	----	17.3	82.7	----	1.1	4.6	90.3	1.3	2.7	----	8,778	15,800	----	----	----
Sonman slope mine, Upper Freeport bed (face of 2 left entry, south dip entry)	26,398	A	1	3.0	18.1	72.0	6.9	2.3	----	----	----	----	2.5	7,841	14,120	2,140	193	----
Same (at intersection of 3 right aircourse, of south dip entry, 100 feet from face of south dip entry)	26,399	A	1	3.5	18.7	72.2	5.6	1.7	----	----	----	----	2.9	7,928	14,270	2.110	193	----
Same (face of 2 right entry, south dip entry, 20 feet from face).	26,400	A	1	3.5	17.7	72.5	6.3	2.1	----	----	----	----	2.9	7,889	14,200	2,050	193	----
Same (face of 13 room, 1 right entry, north dip entry).	26,401	A	1	3.6	19.5	71.1	5.8	1.3	----	----	----	----	3.0	7,894	14,210	2,280	193	----
Same (face of 1 cut-through of 4 room, 2 left entry, north dip entry).	26,402	A	1	3.1	18.9	70.8	7.2	2.1	----	----	----	----	2.5	7,794	14,030	2,190	193	----
Same (face of north dip entry, 20 feet from face)	26,403	A	1	3.4	19.0	71.5	6.1	1.4	----	----	----	----	2.8	7,894	14,210	2.200	193	----
Same (composite of samples 26,399 to 26,403 inclusive).	26,404	A	1	3.3	18.3	72.0	6.4	1.8	4.7	80.7	1.4	5.0	2.8	7,872	14,170	----	193	----
			2	----	18.9	74.5	6.6	1.8	4.5	83.4	1.5	2.2	----	8,144	14,660	----	----	----
			3	----	20.2	79.8	----	2.0	4.8	89.4	1.6	2.2	----	8,722	15,700	----	----	----
1⅓ miles southeast of; Trout Run No. 5 mine Upper Freeport bed (face of 9 room, 230 feet from 3 left heading 1,900 feet northeast of mine mouth)	W46,811	A	1	1.7	20.9	69.6	7.8	1.8	----	----	----	----	----	7,861	14,150	----	123	----
Same (face of 3 room, 1 right heading, 700 feet northeast of mine mouth).	W46,812	A	1	2.6	19.5	69.5	8.4	1.5	----	----	----	----	----	7,744	13,940	----	123	----
Same (face of 26 room, 30 feet off 2 left heading, 2,500 feet northeast of mine mouth)	W46,813	A	1	2.2	20.0	67.4	10.4	3.2	----	----	----	----	----	7,556	13,600	----	123	----

Same (face of 3 left aircourse, opposite 15 room, 2,500 feet northeast of mine mouth).	W46,814	A	1	2.1	20.3	70.3	7.3	1.3	-----	-----	-----	-----	-----	7,894	14,210	-------	122	-----
Same (face of 2 right heading, opposite 13 room, 1,000 feet east of mine mouth).	W46,815	A	1	2.8	18.7	71.4	7.1	2.1	-----	-----	-----	-----	-----	7,850	14,130	-------	123	-----
Same (composite of samples W46,811 to W46,815 inclusive).	19,610	A	1	2.3	19.0	70.5	8.2	2.2	4.6	79.3	1.4	4.3	-----	7,756	13,960	-------	123	-----
			2	-----	19.5	72.1	8.4	2.2	4.4	81.2	1.4	2.4	-----	7,939	14,290	-------	-----	-----
			3	-----	21.3	78.7	-----	2.4	4.8	88.6	1.6	2.6	-----	8,667	15,600	-------	-----	-----
2 miles north of; Forge slope No. 1 mine, Upper Kittanning bed (face of main south heading, 1 mile south of mine mouth).	W20,396	A	1	2.0	16.3	74.1	7.6	.6	-----	-----	-----	-----	-----	7,872	14,170	-------	85	-----
Same (on rib, near face of 7 left entry, main south entry, 1 mile west of mine mouth).	W20,397	A	1	1.8	18.3	70.0	9.9	2.6	-----	-----	-----	-----	-----	7,656	13,780	-------	85	-----
Same (on rib, near face of 2 right entry, 7 left entry main south entry, 4,500 feet northwest of mine mouth).	W20,398	A	1	1.8	18.1	70.8	9.3	2.6	-----	-----	-----	-----	-----	7,722	13,900	-------	85	-----
				2.3	15.1	73.5	9.1	2.3	-----	-----	-----	-----	-----	7,717	13,890	-------	85	-----
Same (on rib near face of 1 right entry 7 left entry, main south heading 5,000 feet southwest mine mouth).	W20,399	A	1															
				1.9	16.7	73.4	8.0	1.4	-----	-----	-----	-----	-----	7,828	14,090	-------	85	-----
Same (face of main north heading, 3,000 feet north of mine mouth).	W20,400	A	1	2.1	17.0	72.5	8.4	1.0	-----	-----	-----	-----	-----	7,772	13,990	-------	85	-----
Same (on rib, near face of 3 right entry, main north entry, 2,600 feet north of mine mouth).	W20,401	A	1	.9	18.4	71.8	8.9	1.9	4.4	80.1	1.2	3.5	-----	7,822	14,080	-------	85	-----
Same (composite of samples W20,396 to W20,401 inclusive).	12,369	A	1	-----	18.6	72.4	9.0	1.9	4.3	80.9	1.2	2.7	-----	7,900	14,220	-------	-----	-----
			2	-----	20.4	79.6	-----	2.1	4.7	88.9	1.4	2.9	-----	8,678	15,620	-------	-----	-----
			3	3.3	17.5	72.6	6.6	.7	-----	-----	-----	-----	-----	7,861	14,150	-------	85	-----
2½ miles east of; Plymouth No. 1 mine, Upper Kittanning bed (face of 5 dip heading, 300 feet from main heading).	W17,110	A	1															
Same (face of 4 left entry, 2,000 feet from main heading.	W17,111	A	1	3.5	17.5	70.7	8.3	1.5	-----	-----	-----	-----	-----	7,694	13,850	-------	85	-----
Same (face of main heading, 250 feet from 8 left entry).	W17,112	A	1	3.3	16.5	72.9	7.3	.7	-----	-----	-----	-----	-----	7,817	14,070	-------	85	-----
Same composite of samples W17,110 to W17,112 inclusive).	11,705	A	1	2.0	-----	-----	7.6	1.1	4.5	78.4	1.2	7.2	-----	-----	-----	-------	85	-----
			2	-----	-----	-----	7.8	1.1	4.3	79.9	1.2	5.7	-----	-----	-----	-------	-----	-----
			3	-----	-----	-----	-----	1.2	4.7	86.6	1.3	6.2	-----	-----	-----	-------	-----	-----
2½ miles southeast of; Puritan No. 1 mine, Lower Kittanning bed (1 dip level, 13,600 feet from shaft bottom).	10,288	A	1	3.7	16.0	72.9	7.4	2.3	-----	-----	-----	-----	3.2	7,750	13,950	2,330	22	-----
Same (upper inside level, 13,300 feet from shaft bottom).	10,289	A	1	3.4	17.3	71.7	7.6	1.9	-----	-----	-----	-----	2.9	7,739	13,930	2,580	22	-----
Same (face of 1 right entry, new slope, 1,500 feet from shaft bottom).	10,290	A	1	3.2	16.7	73.4	6.7	1.9	-----	-----	-----	-----	2.9	7,861	14,150	2,370	22	-----
Same (face of 1 left entry, new slope, 1,400 feet from shaft bottom).	10,291	A	1	3.4	16.0	72.7	7.9	1.9	-----	-----	-----	-----	2.9	7,733	13,920	2,220	22	-----
Same (composite of samples 10,288 to 10,291 inclusive).	10,299	A	1	3.5	17.5	71.8	7.2	2.0	4.9	79.7	1.2	5.0	3.0	7,783	14,010	-------	22	-----
			2	-----	18.2	74.3	7.5	2.0	4.7	82.5	1.3	2.0	-----	8,067	14,520	-------	-----	-----
			3	-----	19.6	80.4	-----	2.2	5.1	89.2	1.4	2.1	-----	8,711	15,680	-------	-----	-----
St. Benedict; Victor No. 6 mine, Lower Freeport bed (face of main heading, 5,850 feet from mine mouth).	7,954	B	1	2.8	21.2	67.0	9.0	1.8	4.9	77.8	1.3	5.2	1.9	7,644	13,760	-------	22	-----
			2	-----	21.8	69.0	9.2	1.9	4.7	80.0	1.3	2.9	-----	7,867	14,160	-------	-----	-----
			3	-----	24.0	76.0	-----	2.1	5.2	88.2	1.5	3.0	-----	8,667	15,600	-------	-----	-----
Same (face of 7 left heading).	7,956	B	1	2.6	22.1	67.8	7.5	1.7	-----	-----	-----	-----	1.8	7,772	13,990	-----	22	-----
Victor No. 10 mine, Lower Kittanning bed face of 2 right heading).	7,960	B	1	2.0	19.5	70.9	6.7	1.8	5.0	79.8	1.3	5.4	2.1	7,855	14,140	-------	22	-----
			2	-----	20.1	73.0	6.9	1.8	4.9	82.2	1.3	2.9	-----	8,095	14,570	-------	-----	-----
			3	-----	21.6	78.4	-----	1.9	5.2	88.3	1.4	3.2	-----	8,694	15,650	-------	-----	-----

*, †, ‡, §, ¶, See footnoot page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (near tail heading, toward No. 9 mine),	7,966	B	1	3.2	19.3	71.1	6.4	1.4					2.5	7,906	14,230		22	
St. Bonifice; Pardee No. 27 mine, Lower Freeport bed (face of main heading).	7,964	B	1	2.2	23.8	65.4	8.6	1.8	4.8	78.5	1.3	5.0	1.5	7,711	13,880		22	
			2		24.4	66.8	8.8	1.9	4.7	80.2	1.3	3.1		7,883	14,190			
			3		26.7	73.3		2.1	5.1	88.0	1.5	3.3		8,644	15,560		22	
Same (600 feet from pit mouth, and 8 yards from main heading).	7,967	B	1	2.3	22.2	67.2	8.3	1.8					1.5	7,711	13,880		22	
St. Michael, ½ mile of; Maryland shaft mine, Lower Kittanning bed (face of 7 left main entry).	25,717	A	1	3.4	15.4	76.2	5.0	.9					2.5	8,039	14,470	3,010	193	
Same (face of 2 longwall),	25,718	A	1	2.4	15.5	76.9	5.2	.7					1.5	8,100	14,580	3,010	193	
Same (face of 2 left entry, south main entry)	25,719	A	1	2.9	15.6	75.0	6.5	1.3					2.1	7,917	14,250	2,640	193	
Same (face of 7 left entry, south main entry)	25,720	A	1	3.5	15.2	73.5	7.8	1.3					2.6	7,739	13,970	2,630	193	
Same (composite of samples 25,717 to 25,720 inclusive).	25,721	A	1	3.1	15.4	75.4	6.1	1.0	4.4	81.7	1.3	5.5	2.2	7,911	14,240		193	
			2		15.8	77.9	6.3	1.1	4.2	84.3	1.4	2.7		8,161	14,690			
			3		16.9	83.1		1.1	4.5	90.0	1.4	3.0		8,717	15,690			
Same (19 pillar, 6 right north entry),	25,722	A	1	2.1	15.7	76.7	5.5	.6					1.3	8,106	14,590	3,010	193	
			2		16.0	78.4	5.6	.7						8,283	14,910			
Same (face of 3 right dip entry),	W68,185	A	1	3.1	15.5	75.9	5.5	.7						7,950	14,310	3,010	193	
Same (face of C heading on longwall),	W68,187	A	1	2.7	15.9	74.9	6.5	1.0						7,928	14,270	2,750	193	
Same (face of 6 longwall),	W68,193	A	1	2.1	15.5	76.4	6.0	1.0						8,017	14,430	2,630	193	
Same (face of 2 right entry, 3 right entry),	W68,219	A	1	2.5	14.9	77.2	5.4	.8						8,011	14,420	2,670	193	
Same (face of south main entry),	W68,220	A	1	2.8	14.6	76.4	6.2	.8						7,950	14,310	3,010	193	
Same (composite of samples W68,185, W68,187, W68,193, W68,219 and W68,220).	30,152	A	1	2.6	15.5	76.0	5.9	1.0	4.4	82.7	1.3	4.7		7,939	14,290		193	
			2		15.9	78.0	6.1	1.0	4.2	84.9	1.3	2.5		8,150	14,670			
			3		16.9	83.1		1.1	4.5	90.4	1.4	2.6		8,678	15,620			
South Fork: Argyle No. 1 mine, Lower Kittanning bed (face of 3 north entry, 6 entry),	W69,453	A	1	1.7	18.0	75.0	5.3	.7						8,072	14,530		193	
			2		18.3	76.3	5.4	.7						8,211	14,780			
Same (at split in pillar, between 5 and 6 north entries).	W69,455	A	1	1.8	18.2	74.7	5.3	1.1						8,100	14,580		193	
			2		18.5	76.1	5.4	1.1						8,241	14,840			
Same (face of main heading, 1 mile from mine mouth).	W69,456	A	1	2.1	17.2	73.5	7.2	1.1						7,861	14,150		193	
			2		17.6	75.1	7.3	1.2						8,028	14,450			

Argyle No. 2 mine, Lower Kittanning bed (face of 7 right entry, 10 feet from face of 10 room).	W69,451	A	1	2.2	17.8	73.0	7.0	2.2	-----	-----	-----	-----	-----	7,872	14,170	-----	193	-----
			2	-----	18.2	74.6	7.2	2.3	-----	-----	-----	-----	-----	8,044	14,480	-----	-----	-----
Same (face of 6 room, chain pillar, 5 left entry)	W69,452	A	1	2.8	18.0	71.7	7.5	2.3	-----	-----	-----	-----	-----	7,794	14,030	-----	193	-----
			2	-----	18.5	73.8	7.7	2.4	-----	-----	-----	-----	-----	8,017	14,430	-----	-----	-----
Same (face of 2 right entry, 9 entry, 1 rib),	W69,454	A	1	1.9	18.8	74.3	5.0	1.5	-----	-----	-----	-----	-----	8,083	14,550	-----	193	-----
			2	-----	19.2	75.7	5.1	1.5	-----	-----	-----	-----	-----	8,239	14,830	-----	-----	-----
Priscilla No 1 mine, Lower Kittanning bed (face of main heading, 2,300 feet north of mine mouth).	7,624	A	1	1.1	16.0	75.2	7.7	1.4	-----	-----	-----	-----	-----	7,994	14,390	-----	22	-----
			2	-----	16.1	76.1	7.8	1.4	-----	-----	-----	-----	-----	8,083	14,550	-----	-----	-----
Same (face of 8 room, 7 heading, 1,300 feet north of mine mouth).	7,625	A	1	1.1	16.7	75.8	6.4	1.0	-----	-----	-----	-----	-----	8,083	14,550	-----	22	-----
			2	-----	16.9	76.6	6.5	1.0	-----	-----	-----	-----	-----	8,172	14,710	-----	-----	-----
Stineman No. 1 mine, Lower Kittanning bed,	3,786	B	1	2.2	14.3	78.2	5.3	.5	-----	-----	-----	-----	1.6	-----	-----	-----	22	-----
Stineman No. 5 mine, Upper Freeport bed,	3,784	B	1	3.0	16.3	73.5	7.2	2.2	-----	-----	-----	-----	2.5	-----	-----	-----	22	-----
Stineman No. 2 mine, Lower Kittanning bed (face of 13 west entry, main entry, 10,200 feet southwest of mine mouth).	9,041	A	1	3.0	14.0	77.2	5.8	1.3	-----	-----	-----	-----	2.3	-----	-----	-----	22	-----
Same (12 west entry, main entry, 11,000 feet southwest of mine mouth).	9,042	A	1	2.1	15.0	77.8	5.1	.9	-----	-----	-----	-----	1.5	-----	-----	-----	22	-----
Same (face of 11 west entry, main entry, 1,500 feet southwest of mine mouth).	9,043	A	1	2.3	15.0	77.1	5.6	1.4	-----	-----	-----	-----	1.7	-----	-----	-----	22	-----
Same (face of 10 new west entry, main entry, 11,400 feet southwest of mine mouth).	9,044	A	1	2.1	15.0	77.5	5.4	1.2	-----	-----	-----	-----	1.5	-----	-----	-----	22	-----
Same (composite of samples 9,041 to 9,044 inclusive,	9,071	A	1	2.4	15.0	77.1	5.5	1.3	4.5	83.0	.9	4.8	1.8	8,056	14,500	-----	22	-----
			2	-----	15.0	79.3	5.7	1.3	4.3	85.0	.9	2.8	-----	8,250	14,850	-----	-----	-----
			3	-----	16.0	84.0	-----	1.4	4.6	90.1	1.0	2.9	-----	8,744	15,740	-----	-----	-----
Same (pillar, 16 room, 9 west entry, main entry, 10,100 feet southwest of mine mouth).	9,045	A	1	2.1	15.0	77.7	5.2	1.1	-----	-----	-----	-----	1.5	8,128	14,630	-----	22	-----
			2	-----	15.0	79.7	5.3	1.2	-----	-----	-----	-----	-----	8,300	14,940	-----	-----	-----
Stineman No. 4 mine, Lower Kittanning bed (9 pillar, 18 right entry, main entry).	9,038	A	1	2.3	13.5	79.0	5.2	.6	-----	-----	-----	-----	1.7	8,150	14,670	-----	22	-----
			2	-----	13.5	81.2	5.3	.6	-----	-----	-----	-----	-----	8,345	15,020	-----	-----	-----
Same (face of 8 right entry, new dip entry),	9,037	A	1	1.4	12.5	78.6	7.5	1.0	-----	-----	-----	-----	1.8	-----	-----	-----	22	-----
Same (face of 3 room, right slant, 16 right entry, main entry).	9,039	A	1	3.4	13.0	76.1	7.5	1.2	-----	-----	-----	-----	2.7	-----	-----	-----	22	-----
Same (16 right entry, main entry),	9,040	A	1	3.3	13.5	76.4	6.8	1.5	-----	-----	-----	-----	2.7	-----	-----	-----	22	-----
Same (composite of samples 9,037, 9,039, and 9,040),	9,070	A	1	2.6	13.0	76.9	7.5	1.3	4.4	81.1	1.0	4.7	2.1	7,883	14,190	-----	22	-----
			2	-----	13.5	78.8	7.7	1.3	4.2	83.2	1.0	2.6	-----	8,089	14,560	-----	-----	-----
			3	-----	14.5	85.5	-----	1.4	4.6	90.2	1.1	2.7	-----	8,756	15,760	-----	-----	-----
Stineman No. 6 mine, Upper Kittanning bed,	3,785	B	1	2.8	15.1	72.6	9.5	1.9	-----	-----	-----	-----	2.2	-----	-----	-----	22	-----
Wickes mine, Brookville bed,	3,788	B	1	2.4	14.3	71.3	12.0	3.3	4.2	75.2	1.1	4.2	1.8	7,383	13,290	-----	22	-----
			2	-----	14.6	73.2	12.2	3.4	4.1	77.0	1.2	2.1	-----	7,561	13,610	-----	-----	-----
			3	-----	16.7	83.3	-----	3.9	4.6	87.7	1.3	2.5	-----	8,617	15,510	-----	-----	-----
1 mile northwest of; Argyle No. 3 mine, Lower Kittanning bed.	3,787	B	1	2.2	15.7	78.4	3.7	.8	-----	-----	-----	-----	1.6	-----	-----	-----	22	-----
Spangler, 2 miles northwest of; Pennsylvania No. 21 mine, Lower Freeport bed (face of main heading, 5,000 feet southwest of mine mouth).	12,144	A	1	4.5	22.7	67.7	5.1	.6	-----	-----	-----	-----	3.8	7,867	14,160	3,010	85	-----
Same (face of 2 main entry, 6,500 feet from mine mouth).	12,145	A	1	2.4	25.8	65.8	6.0	1.2	-----	-----	-----	-----	1.4	7,967	14,340	2,660	85	-----
Same (face of 17 back heading, 5,900 feet west of mine mouth).	12,146	A	1	3.0	26.0	64.3	6.1	1.7	-----	-----	-----	-----	2.1	7,900	14,220	2,300	85	-----
Same (face of 4 right entry, 2 main entry, 6,300 feet east of mine mouth).	12,147	A	1	2.7	26.5	63.0	8.0	1.6	-----	-----	-----	-----	1.9	7,772	13,990	2,240	85	-----
Same (composite of samples 12,144 to 12,147 inclusive).	12,148	A	1	3.1	26.0	64.4	6.5	1.4	5.1	79.6	1.3	6.1	2.3	7,867	14,160	-----	85	-----
			2	-----	26.9	66.4	6.7	1.4	4.9	82.1	1.3	3.6	-----	8,122	14,620	-----	85	-----
			3	-----	28.8	71.2	-----	1.5	5.2	88.0	1.4	3.9	-----	8,700	15,660	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
2 miles northwest of; Pennsylvania No. 22 mine, Lower Freeport bed (face of 9 main entry, 7,200 feet southwest of mine mouth).	12,126	A	1	4.9	21.9	67.4	5.8	1.0	----	----	----	----	3.9	7,806	14,050	2,620	85	----
Same (rib of 9 room, right main entry, 9 main entry, 6,200 feet southwest of mine mouth).	12,127	A	1	2.6	22.5	68.1	6.8	1.2	----	----	----	----	1.7	7,894	14,210	2,540	85	----
Same (face of 17 room, 6 right entry, 9 main entry, 7,400 feet from mine mouth).	12,140	A	1	2.8	23.2	67.5	6.5	1.6	----	----	----	----	2.3	7,822	14,080	2,530	85	----
Same (face of main back heading, 7,100 feet from mine mouth).	12,141	A	1	2.7	23.7	66.9	6.7	1.4	----	----	----	----	2.0	7,906	14,230	2,530	85	----
Same (face of 14 right entry, main heading, 7,200 feet from mine mouth).	12,142	A	1	2.6	23.7	67.7	6.0	1.0	----	----	----	----	1.9	7,967	14,340	2,880	85	----
Same (composite of samples 12,126, 12,127, 12,140 to 12,142 inclusive).	12,143	A	1	3.1	22.8	67.5	6.6	1.2	4.9	80.5	1.4	5.4	2.4	7,856	14,140	----	85	----
			2	----	23.5	69.7	6.8	1.3	4.7	83.1	1.4	2.7	----	8,106	14,590	----	----	----
			3	----	25.2	74.8	----	1.4	5.1	89.1	1.5	2.9	----	8,694	15,650	----	----	----
2 miles south of; Watkins No. 3 mine, Lower Kittanning bed (face of 21 room, 10 left entry, ¾ mile from mine mouth).	79,969	A	1	2.9	23.8	65.9	7.4	1.7	----	----	----	----	2.2	7,822	14,080	2,530	----	----
			2	----	24.5	67.9	7.6	1.7	----	----	----	----	----	8,049	14,490	----	----	----
Twin Rocks, near; Big Bend No. 1 mine, Lower Kittanning bed (face of 11 room, drainage heading, 2,600 feet northeast of mine mouth).	W19,668	A	1	2.4	20.0	71.7	5.9	1.7	----	----	----	----	----	8,094	14,570	----	85	----
Same (face of water-level heading, 2,000 feet northeast of mine mouth).	W19,669	A	1	1.9	19.7	72.4	6.0	.6	----	----	----	----	----	8,078	14,540	----	85	----
Same (composite of samples W19,668 and W19,669).	12,215	A	1	1.3	20.6	72.1	6.0	1.7	4.8	83.0	1.3	3.2	----	8,122	14,620	----	85	----
			2	----	20.8	73.1	6.1	1.8	4.7	84.1	1.4	1.9	----	8,228	14,810	----	----	----
			3	----	22.2	77.8	----	1.9	5.0	89.5	1.4	2.2	----	8,761	15,770	----	----	----
Same (pillar opposite 16 room, Claghorn section, 3,000 feet east of mine mouth).	W19,672	A	1	2.0	19.5	73.0	5.5	1.5	----	----	----	----	----	8,078	14,540	----	85	----
Same (pillar to left of main heading, 2,500 feet of mine mouth).	W19,674	A	1	2.2	20.0	72.7	5.1	1.5	----	----	----	----	----	8,156	14,680	----	85	----
Same (pillar to left of main heading, opposite 6 and 7 right headings, 2,000 feet east of mine mouth)	W19,676	A	1	2.6	20.3	72.2	4.9	1.2	----	----	----	----	----	8,106	14,590	----	85	----

Same (composite of samples W19,672, W19,674 and W19,676).	12,208	A	1	1.3	20.3	73.1	5.3	1.4	4.7	83.5	1.3	3.8	-----	8,200	14,760	-----	85	-----
			2	-----	20.6	74.0	5.4	1.4	4.6	84.6	1.4	2.6	-----	8,311	14,960	-----	-----	-----
			3	-----	21.8	78.2	-----	1.5	4.8	89.4	1.4	2.9	-----	8,789	15,820	-----	-----	-----
1 mile north of; Big Bend No. 6 mine, Lower Kittanning bed (face of 1 room, left side of 1 right heading, 9 drift, 900 feet south of No. 9 opening). opening).	W19,670	A	1	2.7	18.9	72.6	5.8	1.8	-----	-----	-----	-----	-----	8,017	14,430	-----	85	-----
Same (face of heading, 325 feet from outcrop, feet southeast of mine mouth).	W19,673	A	1	3.2	18.7	73.2	4.9	1.0	-----	-----	-----	-----	-----	8,011	14,420	-----	85	-----
Same (face of 10 room, left side of No. 9 drift, 700 feet southwest of No. 9 opening).	W19,677	A	1	2.6	20.0	72.1	5.3	1.0	-----	-----	-----	-----	-----	8,061	14,510	-----	86	-----
				1.5	20.7	72.4	5.4	1.4	4.7	83.2	1.4	3.9	-----	8,139	14,650	-----	85	-----
Same (composite of samples W19,670, W19,673 and W19,677).	12,227	A	1															
			2	-----	21.0	73.5	5.5	1.4	4.6	84.5	1.4	2.6	-----	8,267	14,880	-----	-----	-----
			3	-----	22.2	77.8	-----	1.5	4.9	89.4	1.5	2.7	-----	8,744	15,740	-----	-----	-----
Same (pillar between 23 and 24 rooms, main heading, 1,500 feet northeast of mine mouth).	W19,671	A	1	2.8	19.4	72.5	5.3	1.1	-----	-----	-----	-----	-----	8,006	14,410	-----	85	-----
Same (pillar between 27 and 28 rooms, main heading, 2,000 feet northeast of mine mouth).	W19,675	A	1	2.2	19.7	72.7	5.4	1.1	-----	-----	-----	-----	-----	8,106	14,590	-----	85	-----
Same (composite of samples W19,671 and W19,675),	12,207	A	1	1.5	20.2	72.9	5.4	1.2	4.8	83.4	1.3	3.9	-----	8,167	14,700	-----	85	-----
			2	-----	20.5	74.0	5.5	1.2	4.7	84.7	1.3	2.6	-----	8,289	14,920	-----	-----	-----
			3	-----	21.7	78.3	-----	1.3	4.9	89.6	1.4	2.8	-----	8,778	15,800	-----	-----	-----
Commercial No. 3 mine, Lower Kittanning bed (face of main heading, 6,200 feet northwest of mine	W20,477	A	1	3.1	18.3	71.6	7.0	2.1	-----	-----	-----	-----	-----	7,867	14,160	-----	85	-----
Same (face of 7 right heading, 450 feet off main entry, 50,600 feet northwest of mine mouth).	W20,479	A	1	2.1	20.2	70.4	7.3	2.8	-----	-----	-----	-----	-----	7,906	14,230	-----	85	-----
Same (face of 7 left entry, 700 feet off main entry, 5,300 feet northwest of mine mouth).	W20,480	A	1	2.9	17.8	71.4	7.9	.6	-----	-----	-----	-----	-----	8,028	14,450	-----	85	-----
Same (face of 5 right heading, 5,000 feet from main entry, 4,200 feet north of mine mouth).	W20,481	A	1	2.2	19.4	72.7	5.7	1.8	-----	-----	-----	-----	-----	8,100	14,580	-----	85	-----
Same (composite of samples W20,477, W20,479 to W20,481 inclusive).	12,377	A	1	.8	20.4	72.1	6.7	2.4	4.5	81.9	1.2	3.3	-----	8,083	14,550	-----	85	-----
			2	-----	20.6	72.7	6.7	2.4	4.5	82.6	1.2	2.6	-----	8,150	14,670	-----	-----	-----
			3	-----	22.1	77.9	-----	2.5	4.8	88.5	1.3	2.9	-----	8,739	15,730	-----	-----	-----
Same (pillar, 4 right heading, 5,000 feet from main entry, 4,500 feet northeast of mine mouth).	W20,478	A	1	1.8	20.0	71.5	6.7	1.7	-----	-----	-----	-----	-----	8,011	14,420	-----	85	-----
			2	-----	20.4	72.8	6.8	1.8	-----	-----	-----	-----	-----	8,156	14,680	-----	-----	-----
Commercial No. 4 mine, Lower Kittanning bed (100 feet from face of main heading, 50,200 feet north of mine mouth).	W20,501	A	1	3.8	18.1	71.9	6.2	1.9	-----	-----	-----	-----	-----	7,878	14,180	-----	85	-----
Same (face of 6 east entry, 3 right entry, main entry, 4,000 feet northeast of mine mouth).	W20,505	A	1	2.4	19.0	72.3	6.3	1.9	-----	-----	-----	-----	-----	7,956	14,320	-----	85	-----
Same (rib near face of 7 east entry, 3 right entry, main entry, 4,800 feet northeast of mine mouth).	W20,506	A	1	3.0	18.3	73.1	5.6	1.5	-----	-----	-----	-----	-----	8,011	14,420	-----	85	-----
Same (face of 3 right entry, main entry, 4,900 feet northeast of mine mouth).	W20,508	A	1	3.3	18.2	72.9	5.6	1.8	-----	-----	-----	-----	-----	7,961	14,330	-----	85	-----
Same (composite of samples, W20,501, W20,505, W20,506, and W20,508).	12,364	A	1	.9	19.7	73.3	6.1	2.0	4.6	83.2	1.3	2.8	-----	8,089	14,560	-----	85	-----
			2	-----	19.9	74.0	6.1	2.0	4.5	83.9	1.3	2.2	-----	8,161	14,690	-----	-----	-----
			3	-----	21.2	78.8	-----	2.1	4.8	89.4	1.4	2.3	-----	8,694	15,650	-----	-----	-----
Same (face of 3 main entry, 4 slope), -----	W17,061	A	1	3.3	17.0	73.9	5.8	1.6	-----	-----	-----	-----	-----	7,978	14,360	-----	85	-----
			2	-----	17.5	76.5	6.0	1.7	-----	-----	-----	-----	-----	8,250	14,850	-----	-----	-----
Same (6 pillar on 9 east entry, 2 right entry, main entry, 3,800 feet northeast of mine mouth).	W20,503	A	1	2.8	18.6	72.9	5.7	1.6	-----	-----	-----	-----	-----	7,983	14,370	-----	85	-----
			2	-----	19.1	75.0	5.9	1.6	-----	-----	-----	-----	-----	8,217	14,790	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Commercial No. 5 mine, Lower Kittanning bed face of 1 room, 10 east heading, main entry).	W17,062	A	1	3.3	20.0	72.3	4.4	.9	----	----	----	----	----	8,106	14,590	----	85	----
			2	----	20.5	74.9	4.6	1.0	----	----	----	----	----	8,383	15,090	----	----	----
Same (face of main heading, 4,700 feet northeast of mine mouth).	W20,499	A	1	2.8	18.8	72.4	6.0	2.1	----	----	----	----	----	7,972	14,350	----	85	----
Same (face of 7 room, 1 right heading, 500 feet from 2 parallel entry, 3,400 feet northeast of mine mouth)	W20,500	A	1	2.9	19.2	72.1	5.8	1.7	----	----	----	----	----	8,028	14,450	----	85	----
Same (face of 12 east heading, 325 feet from main entry, 4,700 feet northeast of mine mouth).	W20,502	A	1	2.9	18.9	72.5	5.7	2.0	----	----	----	----	----	8,000	14,400	----	85	----
Same (face of 11 east heading, 800 feet from main entry, 4,000 feet northeast of mine mouth).	W20,504	A	1	2.8	19.2	71.3	6.7	2.2	----	----	----	----	----	7,956	14,320	----	85	----
Same (face of 10 room, 10 east heading, 750 feet, from main heading, 3,900 feet northeast of mine mouth).	W20,507	A	1	3.2	18.2	71.9	6.7	2.2	----	----	----	----	----	7,894	14,210	----	85	----
Same (composite of samples W20,499, W20,500, W20,502, W20,504 and W20,507).	12,375	A	1	.8	20.8	72.1	6.3	2.2	4.6	82.4	1.2	3.3	----	8,072	14,530	----	85	----
			2	----	21.0	72.6	6.4	2.2	4.6	83.1	1.2	2.4	----	8,129	14,650	----	----	----
			3	----	22.4	77.6	----	2.4	4.9	88.7	1.3	2.7	----	8,694	15,650	----	----	----
Van Ormer: Peerless No. 1 mine, Upper Freeport bed (straight entry, 3,00 feet from mine mouth),	10,275	A	1	3.4	23.5	63.3	9.8	1.1	----	----	----	----	2.3	7,533	13,560	2,420	22	----
Same (Gregg heading, 3,500 feet from mine mouth),	10,276	A	1	2.4	23.9	66.0	7.7	.7	----	----	----	----	1.5	7,844	14,120	2,850	22	----
Same (Bader heading, 4,500 feet from mine mouth),	10,277	A	1	2.0	24.6	64.7	8.7	.8	----	----	----	----	1.5	7,756	13,960	3,010	22	----
Same (composite of samples 10,275 to 10,277 inclusive)	10,281	A	1	2.7	25.0	63.6	8.7	.8	4.9	78.2	1.2	6.2	1.8	7,700	13,860	----	22	----
			2	----	25.7	65.4	8.9	.8	4.7	80.4	1.3	3.9	----	7,917	14,250	----	----	----
			3	----	28.2	71.8	----	.9	5.2	88.3	1.4	4.2	----	8,689	15,640	----	----	----
Peerless No. 2 mine Lower Freeport bed (face of 7 left heading, 3,500 feet from mine mouth).	10,272	A	1	2.4	23.7	62.7	11.2	2.4	----	----	----	----	1.7	7,444	13,400	2,330	22	----
Same (face of main heading, 4,000 feet from mine mouth).	10,273	A	1	2.2	24.7	62.7	10.4	2.1	----	----	----	----	1.6	7,561	13,610	2,410	22	----
Same (composite of samples 10,272 and 10,273), --	10,280	A	1	2.3	24.4	62.5	10,8	2.3	4.7	76.1	1.3	4.8	1.7	7,483	13,470	----	22	----
			2	----	25.0	63.9	11.1	2.4	4.6	77.9	1.4	2.6	----	7.661	13,790	----	----	----
			3	----	28.1	71.9	----	2.7	5.2	87.6	1.5	3.0	----	8.611	15,500	----	----	----
Same (pillar on new haulage heading 3,400 feet from mine mouth).	10,274	A	1	3.5	23.1	64.7	8.7	1.7	----	----	----	----	2.6	7.594	13,670	2,500	22	----
			2	----	24.0	67.0	9.0	1.7	----	----	----	----	----	7,872	14,170	----	----	----

Vintondale, ½ mile northwest of; Vinton No. 1 mine, Lower Kittanning bed (face of 10 heading, 2 left entry, 6,000 feet from mine mouth)	322	A	1	2.3	22.4	70.1	5.2	1.3						8,133	14,640		22	
Same (face of 1 left heading, 2 dip entry, 4,000 feet from mine mouth)	320	A	1	1.8	20.2	71.0	7.0	2.3						7,994	14,390		22	
Same (face of 10 heading, 4 right entry, 7,000 feet from mine mouth)	321	A	1	2.6	22.8	68.0	6.6	2.0						7,972	14,350		22	
Same (face of 4 slope, 2,500 feet from mine mouth)	318	A	1	3.0	17.6	72.4	7.0	2.0						7,878	14,180		22	
Same (face of 4 left heading, 4 dip entry, 3,500 feet from mine mouth)	319	A	1	1.9	19.5	70.4	8.2	3.4						7,856	14,140		22	
Same (composite of samples 318 to 322 inclusive)	10,459	A	1	.9	19.9	72.0	7.2	2.4	4.7	81.1	1.3	3.3					22	
			2		20.1	72.7	7.2	2.4	4.7	81.8	1.3	2.6						
			3		21.6	78.4		2.6	5.0	88.2	1.4	2.8						
Same (left rib of 8 room, 1 left entry, 3 section, 10 feet from face).	W69,729	A	1	2.0	20.3	72.4	5.3	1.3						8,089	14,560		193	
			2		20.7	73.9	5.4	1.4						8,250	14,850			
Same (face of 7 left entry, 5 butt entry, 2 section)	W69,730	A	1	2.9	19.0	69.7	8.4	2.8						7,744	13,940		193	
			2		19.6	71.8	8.6	2.9						7,978	14,360			
Same (face of 34 room, 1 break-through, 9 left entry, 1 section)	W69,733	A	1	1.8	22.6	67.9	7.7	2.3						7,872	14,170		193	
			2		23.0	69.2	7.8	2.3						8,017	14,430			
Same (face of 9 room, 8 left entry, 2 section)	W69,734	A	1	1.7	20.4	68.8	9.1	3.2						7,767	13,980		193	
			2		20.7	70.0	9.3	3.2						7,900	14,220			
Vinton No. 6 mine, Lower Kittanning bed (face of 15 room, 5 left entry)	10,257	A	1	3.1	18.4	72.7	5.8	1.3					2.4	7,980	14,380	2,410	22	
Same (face of 6 right entry)	10,254	A	1	3.3	18.0	71.0	7.7	2.6					2.7	7,791	14,030	2,100	22	
Same (face of main heading)	10,256	A	1	4.6	18.0	70.8	6.6	2.1					4.0	7,772	13,990	2,410	22	
Same (face of 5 right entry)	10,255	A	1	4.1	18.6	71.6	5.7	1.4					3.4	7,917	14,250		22	
Same (composite of samples 10,254 to 10,257 inclusive)	10,271	A	1	3.6	18.6	71.3	6.5	2.0	4.9	80.6	1.2	4.8	3.1	7,844	14,120		22	
			2		19.3	73.9	6.8	2.1	4.7	83.6	1.3	1.5		8,139	14,650			
			3		20.7	79.3		2.2	5.0	89.7	1.4	1.7		8,733	15,720			
Same (on rib, 1 right entry, butt entry, 13 right entry, 2 slope entry)	W69,736	A	1	2.4	19.0	69.8	8.8	3.4						7,706	13,870		193	
			2		19.5	71.5	9.0	3.5						7,900	14,220			
Same (on rib, 10 feet from face of 1 left entry, 1 slope entry)	W69,737	A	1	2.5	19.3	70.2	8.0	3.1						7,778	14,000		193	
			2		19.8	72.0	8.2	3.2						7,972	14,350			
Same (on rib, 100 feet from face of 15 right entry, 3 slope entry)	W69,731	A	1	2.5	19.8	71.4	6.3	2.1						7,972	14,350		193	
			2		20.3	73.2	6.5	2.2						8,172	14,710			
Same (face of 13 right entry, 3 slope entry)	W69,735	A	1	2.2	19.6	71.3	6.9	2.2						7,928	14,270		193	
			2		20.0	73.0	7.0	2.2						8,106	14,590			
Same (face of 4 right main entry, 15 left entry, 2 slope entry)	W69,738	A	1	4.8	18.6	65.7	10.9	5.1						7,261	13,070		193	
			2		19.5	69.1	11.4	5.3						7,622	13,720			
Walsall, north of; Ingleside mine, Lower Kittanning bed	3,839	B	1	2.8	14.7	75.7	6.8	1.3					1.9				22	
Weber, near station; on south branch of Black Lick Creek, Commercial No. 4 mine, Lower Kittanning bed (8 heading)	3,831	B	1	2.8	17.3	73.3	6.6	2.5					2.0				22	
Windber (Somerset County), 1½ miles northwest of; Lower Kittanning bed, Eureka No. 40 mine (composite of 3 pillar samples)	9,032	A	1	2.8	14.0	75.4	7.8	1.4	4.4	80.3	1.3	4.8	2.0	7,850	14,130		22	
			2		14.5	77.5	8.0	1.4	4.2	82.6	1.3	2.5		8,078	14,540			
			3		15.5	81.5		1.5	4.6	89.8	1.4	2.7		8,778	15,800			
Same (face of 12 left entry, main entry, 4,600 feet north of mine mouth)	8,913	A	1	3.3	13.0	76.3	7.4	1.4					2.6				22	
Same (face of 3 left entry, 7 right entry, main entry, 4,900 feet northeast of mine mouth)	8,914	A	1	2.8	13.0	77.1	7.1	1.4					2.1				22	

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CAMBRIA COUNTY—Continued.																		
Same (face of 6 left entry, 6 right entry, main entry, 4,500 feet northeast of mine mouth)	8,915	A	1	3.1	13.5	74.8	8.6	1.6	-----	-----	-----	-----	2.4	-----	-----	-----	22	-----
Same (face of main aircourse, 6,100 feet northeast of mine mouth)	8,916	A	1	2.9	14.0	76.9	6.2	.9	-----	-----	-----	-----	2.2	-----	-----	-----	22	-----
Same (composite of samples 8,913 to 8,916 inclusive)	9,031	A	1	2.9	12.5	77.3	7.3	1.4	4.3	80.2	1.3	5.5	2.3	7,872	14,170	-----	22	-----
			2	-----	13.0	79.5	7.5	1.4	4.1	82.6	1.4	3.0	-----	8,106	14,590	-----	-----	-----
			3	-----	14.0	86.0	-----	1.5	4.4	89.3	1.5	3.3	-----	8,767	15,780	-----	-----	-----
Same (face of 25 room, left main entry)	W68,179	A	1	2.4	16.1	74.4	7.1	1.2	-----	-----	-----	-----	-----	7,889	14,200	2,610	193	-----
Same (face of main heading, 600 ft. inby 26 left entry)	W68,190	A	1	3.1	15.9	75.3	5.7	1.2	-----	-----	-----	-----	-----	7,956	14,320	2,610	193	-----
Same (face of 4 room, main entry, 14 right entry)	W68,191	A	1	3.0	15.5	75.4	6.1	1.0	-----	-----	-----	-----	-----	7,917	14,250	2,730	193	-----
Same (face of 19 right main entry)	W68,222	A	1	2.0	16.1	74.5	7.4	.8	-----	-----	-----	-----	-----	7,906	14,230	3,010	193	-----
Same (composite of samples W68,179, W68,190, W68,191 and W68,222)	30,173	A	1	2.6	17.0	73.7	6.7	1.2	4.5	81.7	1.3	4.6	-----	7,911	14,240	-----	193	-----
			2	-----	17.5	75.6	6.9	1.2	4.3	83.9	1.3	2.4	-----	8,122	14,620	-----	-----	-----
			3	-----	18.8	81.2	-----	1.3	4.6	90.1	1.4	2.6	-----	8,722	15,700	-----	-----	-----
2 miles northwest of: Eureka No. 37 mine, Lower Kittanning bed (pillar, 18 right entry, main entry, 7,400 feet from mine mouth)	8,976	A	1	2.4	14.5	75.0	8.1	1.9	-----	-----	-----	-----	1.9	7,889	14,200	-----	22	-----
			2	-----	15.0	76.7	8.3	2.0	-----	-----	-----	-----	-----	8,078	14,540	-----	-----	-----
Same (pillar, 16 left entry, main entry, 6,300 feet from mine mouth)	8,977	A	1	3.8	12.5	78.1	5.6	.9	-----	-----	-----	-----	2.9	7,939	14,290	-----	22	-----
			2	-----	13.0	81.2	5.8	.9	-----	-----	-----	-----	-----	8,250	14,850	-----	-----	-----
Same (face of main aircourse, 8,300 feet from mine mouth)	8,975	A	1	2.6	14.0	77.3	6.1	.8	-----	-----	-----	-----	2.0	-----	-----	-----	22	-----
Same (face of north entry, 9,550 feet from mine mouth)	8,978	A	1	3.3	13.5	77.2	6.0	.9	-----	-----	-----	-----	2.6	-----	-----	-----	22	-----
Same (face of 2 left entry, northwest drift, 4,500 feet from mine mouth)	8,979	A	1	3.2	14.0	75.4	7.4	1.4	-----	-----	-----	-----	2.5	-----	-----	-----	22	-----
Same (face of 2 main north entry, 9,000 feet from mine mouth)	8,980	A	1	3.2	12.5	78.6	5.7	1.1	-----	-----	-----	-----	2.5	-----	-----	-----	22	-----
Same (composite of samples 8,975, 8,978 to 8,980 inclusive)	9,028	A	1	3.3	12.5	77.9	6.3	1.0	4.5	81.7	1.3	5.2	2.4	7,967	14,340	-----	22	-----
			2	-----	12.5	81.0	6.5	1.1	4.2	84.4	1.3	2.5	-----	8,233	14,820	-----	-----	-----
			3	-----	13.5	86.5	-----	1.1	4.5	90.3	1.4	2.7	-----	8,811	15,860	-----	-----	-----

Eureka No. 37-C mine, Upper Kittanning bed (face of main entry, 3,900 feet from mine mouth).	8,981	A	1	3.3	13.0	76.4	7.3	2.1	-----	-----	-----	-----	2.7	-----	-----	-----	22	-----
Same (face of 7 right entry, 3,500 feet from mine mouth).	8,982	A	1	3.1	13.5	75.9	7.5	1.8	-----	-----	-----	-----	2.3	-----	-----	-----	22	-----
Same (face of 4 entry, 4 right entry, 3,200 feet from mine mouth).	8,983	A	1	3.0	12.0	77.4	7.6	1.8	-----	-----	-----	-----	2.3	-----	-----	-----	22	-----
Same (composite of samples, 8,981 to 8,983 inclusive).	9,029	A	1	3.3	12.5	76.6	7.6	2.0	4.3	79.7	1.4	5.0	2.4	7,811	14,060	-----	22	-----
			2	-----	12.5	79.7	7.8	2.0	4.1	82.4	1.4	2.3	-----	8,078	14,540	-----	-----	-----
			3	-----	14.0	86.0	-----	2.2	4.5	89.4	1.5	2.4	-----	8,767	15,780	-----	-----	-----
4½ miles east of; Eureka No. 42 mine, Lower Kittanning bed (face of C main heading, 700 feet north of mine mouth).	6,271	A	1	3.8	15.2	76.9	4.1	.9	-----	-----	-----	-----	3.0	8,056	14,500	-----	22	-----
Same (face of 9 room, 1 right entry, main heading, 1,000 feet north of mine mouth).	6,272	A	1	3.2	15.0	77.6	4.2	.8	-----	-----	-----	-----	2.4	8,106	14,590	-----	22	-----
Same (face of 1 left entry, main heading, 600 feet west of mine mouth).	6,273	A	1	3.0	15.4	77.0	4.6	1.1	-----	-----	-----	-----	2.3	8,072	14,530	-----	22	-----
Same (face of main entry).	8,999	A	1	3.7	13.5	78.6	4.2	.9	-----	-----	-----	-----	2.8	-----	-----	-----	22	-----
Same (face of 2 right entry, main entry).	9,000	A	1	3.1	13.0	79.0	4.9	.8	-----	-----	-----	-----	2.4	-----	-----	-----	22	-----
Same (face of 1 right entry, main entry, near 6 left entry).	9,001	A	1	3.2	12.5	80.6	3.7	.6	-----	-----	-----	-----	2.4	-----	-----	-----	22	-----
Same (face of 3 right entry, 1 left entry, main entry).	9,002	A	1	3.5	13.0	78.4	5.1	1.6	-----	-----	-----	-----	2.6	-----	-----	-----	22	-----
Same (composite of samples 8,999 to 9,002 inclusive).	9,051	A	1	3.4	12.5	79.4	4.7	1.0	4.6	83.4	1.1	5.2	2.6	8,067	14,520	-----	22	-----
			2	-----	13.0	82.2	4.8	1.0	4.3	86.3	1.1	2.5	-----	8,344	15,020	-----	-----	-----
			3	-----	14.0	86.0	-----	1.1	4.6	90.7	1.2	2.4	-----	8,767	15,780	-----	-----	-----
Eureka No. 42-C mine, Upper Kittanning bed (face of 2 right entry, main entry, 1,000 feet northeast of mine mouth).	9,003	A	1	3.0	13.0	76.1	7.9	1.1	4.5	79.8	1.4	5.3	2.1	7,822	14,080	-----	22	-----
			2	-----	13.5	78.3	8.2	1.2	4.3	82.3	1.4	2.6	-----	8,067	14,520	-----	-----	-----
			3	-----	14.5	85.5	-----	1.3	4.7	89.6	1.5	2.9	-----	8,783	15,810	-----	-----	-----
CAMERON COUNTY.																		
Sterling Run, 3 miles northeast of; Berry mine, Mt. Hope (Lower Kittanning) bed (200 feet in entry)	75,467	B	1	6.8	28.4	58.4	6.4	.7	-----	-----	-----	-----	3.8	7,200	12,960	2,850	-----	156
Same (200 feet in entry).	75,468	B	1	6.6	29.1	58.6	5.7	.7	-----	-----	-----	-----	3.7	7,283	13,110	2,940	-----	-----
Same (composite of samples 75,467 and 75,468).	75,469	B	1	6.6	29.1	58.2	6.1	.7	5.4	72.8	1.5	13.5	3.7	7,257	13,060	-----	-----	-----
			2	-----	31.1	62.4	6.5	.8	5.0	78.0	1.6	8.1	-----	7,778	14,000	-----	-----	-----
			3	-----	33.3	66.7	-----	.8	5.3	83.4	1.7	8.8	-----	8,317	14,970	-----	-----	-----
CENTRE COUNTY.																		
Clarence, ½ mile northwest of; Clarence No. 10 mine, Lower Kittanning bed (face of 2 right entry).	81,868	B	1	3.5	22.1	62.8	11.6	1.1	-----	-----	-----	-----	3.1	7,294	13,130	2,910	-----	156
Same (face of 1 room, 2 left entry, main entry)	81,869	B	1	3.6	21.7	60.0	14.7	1.3	-----	-----	-----	-----	3.2	6,950	12,510	2,910	-----	-----
Same (face of main heading).	81,870	B	1	3.5	20.9	59.9	15.7	1.9	-----	-----	-----	-----	3.1	6,850	12,330	2,800	-----	-----
Same (composite of samples 81,868 to 81,870 inclusive).	81,871	B	1	3.5	21.8	60.8	13.9	1.4	4.6	71.7	1.2	7.2	3.1	7,056	12,700	-----	-----	-----
			2	-----	22.6	63.0	14.4	1.5	4.4	74.4	1.3	4.0	-----	7,317	13,170	-----	-----	-----
			3	-----	26.4	73.6	-----	1.7	5.2	86.8	1.5	4.8	-----	8,544	15,380	-----	-----	-----
1½ miles northwest of; Clarence No. 22 mine, Lower A bed (main entry, ⅜ mile from mine mouth).	17,417	B	1	1.9	22.0	61.5	14.6	1.0	4.4	73.3	1.3	5.4	1.2	7,100	12,780	3,010	123	-----
			2	-----	22.4	62.7	14.9	1.0	4.3	74.7	1.3	3.8	-----	7,233	13,020	-----	-----	-----
			3	-----	26.3	73.7	-----	1.2	5.1	87.7	1.5	4.5	-----	8,491	15,280	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CENTRE COUNTY—Continued.																		
1½ miles northeast of; Poormansite mine, Lower Kittanning bed (side entry, 1,000 feet from mine mouth).	17,444	B	1	3.4	22.8	61.4	12.4	.9	4.7	74.4	1.5	6.1	2.1	7,244	13,040	3,010	123	-----
			2	-----	23.6	63.6	12.8	.9	4.5	77.1	1.5	3.2	-----	7,5[illegible]0	13,500	-----	-----	-----
			3	-----	27.1	72.9	-----	1.0	5.1	88.4	1.7	3.8	-----	8,600	15,480	-----	-----	-----
Same Lower Freeport bed (side entry, 600 feet from mine mouth).	17,445	B	1	3.5	22.1	66.6	7.8	1.8	-----	-----	-----	-----	2.2	7,700	13,860	2,220	123	-----
			2	-----	22.9	69.0	8.1	1.9	-----	-----	-----	-----	-----	7,983	14,370	-----	-----	-----
Gillingtown, ½ mile northeast of; No. 15 mine, Lower Freeport bed (main entry, 500 feet from mine mouth).	17,446	B	1	3.5	23.7	61.6	11.2	2.7	4.8	73.5	1.3	6.5	2.1	7,256	13,060	2,300	123	-----
			2	-----	24.6	63.8	11.6	2.8	4.6	76.1	1.4	3.5	-----	7,517	13,530	-----	-----	-----
			3	-----	27.8	72.2	-----	3.1	5.2	86.2	1.6	3.9	-----	8,503	15,310	-----	-----	-----
Moshannon, ½ mile east of; Moshannon No. 20 mine. Lower Kittanning bed (face of 1 left entry, main entry).	81,878	B	1	3.8	24.9	63.7	7.6	1.8	-----	-----	-----	-----	3.3	7,600	13,680	2,[illegible]90	-----	157
Same (face of main heading)	81,879	B	1	4.0	23.7	63.3	9.0	2.2	-----	-----	-----	-----	3.5	7,500	13,500	2,340	-----	-----
Same (composite of samples 81,878 and 81,879).	81,880	B	1	3.9	24.1	63.8	8.2	2.0	5.0	76.9	1.4	6.5	3.4	7,572	13,630	-----	-----	-----
			2	-----	25.1	66.3	8.6	2.1	4.8	80.0	1.4	3.1	-----	7,878	14,180	-----	-----	-----
			3	-----	27.5	72.5	-----	2.3	5.2	87.5	1.6	3.4	-----	8,617	15,510	-----	-----	-----
1⅓ miles northeast of; Cherry Run No. 3 mine, Lower Kittanning bed (right rib, 3 left entry, main entry, 300 feet from main entry).	81,881	B	1	3.4	23.7	66.9	6.0	.8	-----	-----	-----	-----	2.8	7,806	14,050	3,010	-----	157
Same (left rib, main heading, 800 feet from mine mine mouth).	81,883	B	1	3.3	22.2	66.0	8.5	.7	-----	-----	-----	-----	2.9	7,556	13,600	3,010	-----	-----
Same (left rib, main heading, 800 feet from mine mouth).	81,993	B	1	3.3	23.0	67.1	6.6	.7	-----	-----	-----	-----	3.0	7,744	13,940	3,010	-----	-----
Same (composite of samples 81,881 to 81,883 inclusive).	81,884	B	1	3.4	22.9	66.7	7.0	.8	4.9	79.3	1.3	6.7	2.9	7,678	13,820	-----	-----	-----
			2	-----	23.7	69.0	7.3	.8	4.7	82.1	1.3	3.8	-----	7,950	14,310	-----	-----	-----
			3	-----	25.6	74.4	-----	.8	5.1	83.6	1.4	4.1	-----	8,572	15,430	-----	-----	-----
Osceola Mills, ½ mile east of; No. 10 mine, Lower Kittanning bed (face of 20 room, main dip heading, 8,000 feet from mine mouth).	8,481	B	1	2.1	21.5	69.8	6.6	2.0	4.9	80.6	1.3	4.6	5.1	7,928	14,270	-----	22	-----
			2	-----	21.9	71.4	6.7	2.0	4.8	82.3	1.3	2.9	-----	8,100	14,580	-----	-----	-----
			3	-----	23.5	76.5	-----	2.2	5.1	88.2	1.4	3.1	-----	8,6[illegible]3	15,630	-----	-----	-----
¾ mile north of; Mashannon No. 10 mine Lower Kittanning bed (rib of 18 room, 2 left entry, 4 right entry, 40 feet from 2 left entry).	12,057	A	1	2.6	21.5	68.4	7.5	1.9	-----	-----	-----	-----	1.9	7,833	14,100	2,330	85	-----
Same (face of 21 room, left main heading).	12,058	A	1	2.7	22.1	68.4	6.8	2.0	-----	-----	-----	-----	2.1	7,883	14,190	2,420	85	-----
Same (face of 16 room, right main heading, near 1 crosscut to right).	12,059	A	1	2.8	19.6	70.3	7.3	2.1	-----	-----	-----	-----	2.2	7,839	14,110	2,550	85	-----
Same (face of 1 right heading).	12,060	A	1	3.8	20.0	69.1	7.1	1.7	-----	-----	-----	-----	3.2	7,773	14,000	2,530	85	-----
Same (face of 16 room, 2 right heading).	12,061	A	1	3.0	21.3	67.9	7.8	2.5	-----	-----	-----	-----	2.5	7,750	13,950	2,450	85	-----

Same (composite of samples 12,057 to 12,061 inclusive)	12,062	A	1	3.1	21.7	67.8	7.4	2.0	5.0	79.2	1.3	5.1	2.4	7,800	14,040	-----	85	-----
			2	-----	22.3	70.1	7.6	2.0	4.8	81.7	1.4	2.5	-----	8,044	14,480	-----	-----	-----
			3	-----	24.2	75.8	-----	2.2	5.2	88.4	1.5	2.7	-----	8,706	15,670	-----	-----	-----
½ mile south of; Electric mine, Lower Kittanning bed (pillar at 9 room, 5 left entry, main entry)	12,068	A	1	3.5	20.3	68.5	7.7	1.6	-----	-----	-----	-----	2.5	7,717	13,890	3,070	85	-----
Same (pillar at 7 room, 4 right entry, main heading)	12,069	A	1	3.3	21.6	67.7	7.4	2.0	-----	-----	-----	-----	2.3	7,744	13,940	2,620	85	-----
Same (pillar at 5 room, 5 left entry, main heading)	12,070	A	1	3.1	20.7	67.9	8.3	2.5	-----	-----	-----	-----	2.4	7,656	13,780	2,370	85	-----
Same (composite of samples, 12,068 to 12,070 inclusive	12,190	A	1	3.0	22.9	67.4	6.7	1.5	5.0	79.5	1.3	6.0	2.4	7,850	14,130	-----	85	-----
			2	-----	23.6	69.5	6.9	1.6	4.8	82.0	1.4	3.3	-----	8,100	14,580	-----	-----	-----
			3	-----	25.4	74.6	-----	1.7	5.1	83.1	1.5	3.6	-----	8,700	15,660	-----	-----	-----
Same (face of 1 right entry, new drift entry)	12,067	A	1	3.5	20.6	68.5	7.4	1.8	-----	-----	-----	-----	2.8	7,717	13,890	2,700	85	-----
			2	-----	21.3	71.0	7.7	1.9	-----	-----	-----	-----	-----	8,050	14,490	-----	-----	-----
½ mile south of; Weston mine, Lower Kittanning bed (face of 4 left entry, main entry).	12,063	A	1	3.2	19.5	68.8	8.5	2.4	-----	-----	-----	-----	2.5	7,667	13,800	2,450	85	-----
Same (rib of main heading, 7 left entry)	12,064	A	1	2.9	19.5	70.6	7.0	1.9	-----	-----	-----	-----	2.2	7,833	14,100	2,650	85	-----
Same (composite of samples 12,063 and 12,064)	12,066	A	1	3.1	20.3	68.8	7.8	2.1	4.9	79.0	1.3	4.9	2.4	7,756	13,960	-----	85	-----
			2	-----	20.9	71.0	8.1	2.2	4.7	81.5	1.3	2.2	-----	8,000	14,400	-----	-----	-----
			3	-----	22.8	77.2	-----	2.4	5.1	88.7	1.4	2.4	-----	8,706	15,670	-----	-----	-----
Same (pillar at 8 room, 1 right entry, main heading)	12,065	A	1	2.9	19.9	69.7	7.5	1.9	5.0	79.7	1.2	4.7	2.2	7,822	14,080	2,550	85	-----
			2	-----	20.5	71.8	7.7	2.0	4.8	82.1	1.3	2.1	-----	8,061	14,510	-----	-----	-----
			3	-----	22.2	77.8	-----	2.2	5.2	89.0	1.4	2.2	-----	8,733	15,720	-----	-----	-----
Philipsburg, 1 mile east of; Chester mine, Lower Kittanning bed (face of 9 right entry, main entry)	81,817	B	1	6.2	21.2	63.2	9.4	2.5	-----	-----	-----	-----	5.7	7,256	13,060	2,480	-----	158
Same (left rib, 6 left entry, main entry, 200 feet from main entry).	81,818	B	1	4.6	20.8	65.3	9.3	2.4	-----	-----	-----	-----	4.2	7,411	13,340	2,510	-----	-----
Same (composite of samples 81,817 and 81,818)	81,819	B	1	5.4	20.8	64.6	9.2	2.5	4.9	74.8	1.3	7.3	4.9	7,372	13,270	-----	-----	-----
			2	-----	22.0	68.2	9.8	2.7	4.6	79.0	1.3	2.6	-----	7,794	14,030	-----	-----	-----
			3	-----	24.4	75.6	-----	3.0	5.1	87.6	1.5	2.8	-----	8,633	15,540	-----	-----	-----
Smooth Hill No. 2 mine, Brookville bed (face of 1 right entry, main entry).	81,813	B	1	2.9	21.6	63.4	12.1	1.7	-----	-----	-----	-----	2.4	7,272	13,090	2,910	-----	158
Same (face of 10 room, 2 right entry)	81,814	B	1	3.9	20.2	64.8	11.1	2.4	-----	-----	-----	-----	3.3	7,256	13,060	2,620	-----	-----
Same (face of 2 room, main entry)	81,815	B	1	3.1	21.4	64.9	10.6	2.8	-----	-----	-----	-----	2.6	7,372	13,270	2,510	-----	-----
Same (composite of samples 81,813 to 81,815 inclusive	81,816	B	1	3.3	21.2	64.2	11.3	2.3	4.7	74.5	1.1	6.1	2.8	7,294	13,130	-----	-----	-----
			2	-----	21.9	66.4	11.7	2.4	4.5	77.0	1.1	3.3	-----	7,544	13,580	-----	-----	-----
			3	-----	24.8	75.2	-----	2.7	5.0	87.2	1.3	3.8	-----	8,544	15,380	-----	-----	-----
Sandy Ridge, 1½ miles northeast of; Retort mine, Lower Kittanning bed (face of 1 room, 8 right entry, main entry).	81,820	B	1	2.6	24.8	64.7	7.9	1.7	-----	-----	-----	-----	2.1	7,722	13,900	2,680	-----	159
Same (face of 7 room, 4 right entry, main entry)	81,821	B	1	2.6	24.3	64.1	9.0	2.2	-----	-----	-----	-----	2.2	7,589	13,660	2,510	-----	-----
Same (face of 1 room, 5 right entry)	81,822	B	1	2.7	24.1	64.2	9.0	1.7	-----	-----	-----	-----	2.3	7,600	13,680	2,570	-----	-----
Same (composite of samples 81,820 to 81,822 inclusive	81,823	B	1	2.6	24.1	64.5	8.8	1.8	5.0	77.8	1.4	5.2	2.2	7,644	13,760	-----	-----	-----
			2	-----	24.8	66.2	9.0	1.9	4.8	79.9	1.4	3.0	-----	7,844	14,120	-----	-----	-----
			3	-----	27.2	72.8	-----	2.1	5.3	87.8	1.6	3.2	-----	8,617	15,510	-----	-----	-----
CLARION COUNTY.																		
Blue Ball Station; Goss mine, Brookville bed (in room, main heading, 500 feet in entry).	8,487	B	1	1.9	22.0	66.3	9.8	2.0	4.7	78.1	1.1	4.3	1.2	7,644	13,760	-----	22	-----
			2	-----	22.5	67.5	10.0	2.0	4.5	79.6	1.2	2.7	-----	7,794	14,030	-----	-----	-----
			3	-----	25.0	75.0	-----	2.2	5.1	88.5	1.3	2.9	-----	8,661	15,590	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLARION COUNTY—Continued.																		
Church Hill, 1 mile east of; Church Hill mine, Lower Kittanning bed (room neck, 5 butt beading, 3 face heading, 1¼ miles east of mine mouth).	34,825	B	1	4.7	35.3	49.8	10.2	2.0					2.7	7,111	12,800	2,330		159
Same (right room-neck, 4 butt beading, 3 face heading, 1 mile from mine mouth).	34,826	B	1	3.8	37.1	49.7	9.4	2.9					1.7	7,256	13,060	2,320		
Same (composite of samples 34,825 and 34,826)	34,827	B	1	4.2	36.4	49.6	9.8	2.5	5.3	71.2	1.4	9.8	2.2	7,194	12,950			
			2		38.0	51.8	10.2	2.6	5.1	74.3	1.5	6.3		7,506	13,510			
			3		42.3	57.7		2.9	5.7	82.7	1.7	7.0		8,356	15,040			
Clarion, ½ mile west of; Reed bank, Clarion bed, (face of 2 room, 1 left entry, 1 right entry)	82,976	B	1	4.4	37.5	46.4	11.7	6.3					3.4	6,978	12,560	2,280		160
Same (left rib, 2 left heading, at 6½ survey station)	82,977	B	1	3.2	39.8	47.9	9.1	4.0					3.7	7,244	13,040	2,340		
Same (left rib, 2 left heading, at 6½ survey station)	82,978	B	1	3.8	38.3	47.6	10.3	5.0	5.5	69.9	1.2	8.1	3.1	7,139	12,850			
			2		39.8	49.5	10.7	5.2	5.3	72.6	1.3	4.9		7,422	13,360			
			3		44.6	55.4		5.9	5.9	81.3	1.4	5.5		8,317	14,970			
1½ miles northwest of, near Clarion Junction; Cook prospect, Clarion bed (100 feet from mine mouth)	4,173	B	1	4.8	37.9	50.3	7.0	4.0					3.2				22	
3 miles south of; Harvey mine, Lower Kittanning bed (face of 15 room, 1 left heading)	82,972	B	1	4.0	34.7	54.8	6.5	1.1					2.6	7,439	13,390	2,800		160
Same (right rib, 1 room, 2 left heading, 100 feet from face)	82,973	B	1	3.4	36.2	53.5	6.9	.9					2.1	7,494	13,490	2,850		
Same (face of 1 left heading, 2 drift, 5 room stump, 3 cross heading)	82,974	B	1	3.5	37.2	53.5	5.8	.9					2.2	7,600	13,680	2,850		
Same (composite of samples 82,972 to 82,974 inclusive)	82,975	B	1	3.6	35.9	54.2	6.3	1.0	5.6	75.6	1.4	10.1	2.3	7,522	13,540			
			2		37.2	56.3	6.5	1.0	5.4	78.4	1.5	7.2		7,800	14,040			
			3		39.8	60.2		1.1	5.7	83.8	1.6	7.8		8,339	15,010			
Fairmount City, 1½ miles northeast of; No. 1 mine, Lower Kittanning bed (200 feet in entry)	4,170	B	1	2.7	34.8	52.2	10.3	3.7					1.3				22	
2 miles northeast of; Fairmount No. 11 mine, Upper Freeport bed (100 feet in entry)	4,171	B	1	5.6	30.7	57.1	6.6	1.1					3.3				22	

Lawsonham, 1 mile east of; Lawsonham mine, or Mortimer, Lower Kittanning bed (face of main heading)	82,877	B	1	3.4	37.3	52.9	6.4	2.1	-----	-----	-----	-----	2.2	7,656	13,780	2,330	-----	161
Same (face of 12 room, 9 right heading)	82,878	B	1	3.0	38.7	50.9	7.4	2.7	-----	-----	-----	-----	1.9	7,533	13,560	2,240	-----	-----
Same (face of 9 room, 8 left entry, main entry)	82,879	B	1	2.8	39.5	50.5	7.2	2.4	-----	-----	-----	-----	1.9	7,578	13,640	2,250	-----	-----
Same (composite of samples 82,877 to 82,879 inclusive)	82,880	B	1	3.0	38.3	52.0	6.7	2.4	5.6	75.4	1.3	8.6	2.0	7,572	13,630	-----	-----	-----
			2	-----	39.5	53.6	6.9	2.5	5.4	77.7	1.3	6.2	-----	7,811	14,060	-----	-----	-----
			3	-----	42.4	57.6	-----	2.6	5.8	83.5	1.4	6.7	-----	8,389	15,100	-----	-----	-----
New Bethlehem, 1 mile northwest of; Shenkle county bank, Upper Kittanning bed	4,177	B	1	4.1	30.2	57.4	8.3	1.0	-----	-----	-----	-----	2.1	-----	-----	-----	22	-----
3 miles northeast of; Fairmount No. 12 mine, Lower Freeport bed (200 feet in entry)	4,172	B	1	3.3	33.8	56.8	6.1	2.7	-----	-----	-----	-----	1.8	-----	-----	-----	22	-----
Parker, ⅔ mile north of; Clarion River mine, Upper Kittanning (?) bed (face of 4 entry, 1 mile from mine mouth)	34,822	B	1	2.8	38.2	50.1	8.9	5.1	-----	-----	-----	-----	.9	7,367	13,260	2,060	-----	162
Same (face of 4 air-way, 1 mile from mine mouth)	34,823	B	1	3.1	39.6	50.0	7.3	4.0	-----	-----	-----	-----	1.2	7,500	13,500	2,270	-----	-----
Same (composite of samples 34,822 and 34,823)	34,824	B	1	2.9	38.8	50.0	8.3	4.5	5.4	73.3	1.3	7.2	1.1	7,433	13,380	-----	-----	-----
			2	-----	39.9	51.6	8.5	4.6	5.3	75.5	1.4	4.7	-----	7,656	13,780	-----	-----	-----
			3	-----	43.7	56.3	-----	5.1	5.7	82.5	1.5	5.2	-----	8,372	15,070	-----	-----	-----
Phillipston, ½ mile north of; W. J. J. James mine, Lower Kittanning bed (face of 5 left heading, 600 yds. in entry)	34,831	B	1	3.1	38.4	51.2	7.3	3.0	-----	-----	-----	-----	1.4	7,461	13,430	2,310	-----	162
Same (face of 1 right heading, 10 room, 300 yds. in entry)	34,832	B	1	2.7	38.0	52.3	7.0	3.0	-----	-----	-----	-----	1.0	7,556	13,600	2,300	-----	-----
Same (composite of samples 34,831 and 34,832)	34,833	B	1	2.8	38.4	51.7	7.1	3.0	5.5	74.5	1.4	8.5	1.2	7,506	13,510	-----	-----	-----
			2	-----	39.5	53.2	7.3	3.1	5.3	76.6	1.4	6.3	-----	7,722	13,900	-----	-----	-----
			3	-----	42.6	57.4	-----	3.3	5.8	82.6	1.6	6.7	-----	8,328	14,990	-----	-----	-----
Red Bank, 1½ miles east of; Mortimer Run mine, Lower Kittanning bed (face of 3 room, 1 left entry)	83,019	B	1	2.8	40.3	51.9	5.0	2.4	-----	-----	-----	-----	1.9	7,767	13,980	2,260	-----	161
Same (face of main heading)	83,020	B	1	2.7	39.3	51.1	6.9	2.1	-----	-----	-----	-----	2.0	7,578	13,640	2,280	-----	-----
Same (face of 2 room, 1 right entry)	83,021	B	1	2.9	39.6	51.8	5.7	2.5	-----	-----	-----	-----	2.1	7,656	13,780	2,280	-----	-----
Same (composite of samples 83,019 to 83,021 inclusive)	83,022	B	1	2.9	39.3	51.8	6.0	2.3	5.6	76.4	1.4	8.3	2.0	7,667	13,800	-----	-----	-----
			2	-----	40.5	53.3	6.2	2.3	5.4	78.6	1.4	6.1	-----	7,894	14,210	-----	-----	-----
			3	-----	43.2	56.8	-----	2.5	5.8	83.8	1.5	6.4	-----	8,411	15,140	-----	-----	-----
Rimersburg, 1 mile south of; Acme mine, Lower Kittanning bed (800 feet in entry)	4,055	B	1	4.1	34.8	55.3	5.8	2.4	-----	-----	-----	-----	2.6	-----	-----	-----	22	-----
3½ miles northeast of; Mohney County bank, Upper Kittanning bed	4,176	B	1	5.9	30.5	48.6	15.0	1.6	-----	-----	-----	-----	3.9	-----	-----	-----	22	-----
St. Petersburg; Bostaph mine, Clarion bed (face of butt heading)	83,056	B	1	3.9	39.1	50.1	6.9	3.3	-----	-----	-----	-----	2.4	7,406	13,440	2,110	-----	162
Same (face of 3 room, main air-course)	83,057	B	1	3.4	38.7	49.4	8.5	3.6	-----	-----	-----	-----	1.9	7,322	13,180	2,110	-----	-----
Same (face of 3 room, right side, main entry)	83,058	B	1	3.2	39.1	48.6	9.1	3.4	-----	-----	-----	-----	1.7	7,350	13,230	2,150	-----	-----
Same (composite of samples 83,056 to 83,058 inclusive)	83,059	B	1	3.5	39.1	49.2	8.2	3.5	5.3	73.0	1.3	8.7	2.0	7,383	13,290	-----	-----	-----
			2	-----	40.5	51.0	8.5	3.6	5.1	75.6	1.3	5.9	-----	7,644	13,760	-----	-----	-----
			3	-----	44.3	55.7	-----	3.9	5.5	82.6	1.5	6.5	-----	8,356	15,040	-----	-----	-----
Sarah Furnace, ½ mile north of; Sarah Furnace mine, Lower Kittanning bed (face of 40-A butt heading, 2 miles from mine mouth)	34,834	B	1	3.1	37.2	51.6	8.1	3.2	-----	-----	-----	-----	.8	7,417	13,350	2,150	-----	163
Same (face of 33-A butt heading, 2¼ miles from mine mouth)	34,835	B	1	2.9	38.0	50.8	8.3	3.4	-----	-----	-----	-----	1.0	7,406	13,330	2,180	-----	-----
Same (composite of samples 34,834 and 34,835)	34,836	B	1	2.7	37.9	51.3	8.1	3.3	5.4	73.3	1.4	8.5	.9	7,406	13,330	-----	-----	-----
			2	-----	38.9	52.8	8.3	3.4	5.2	75.4	1.4	6.3	-----	7,611	13,700	-----	-----	-----
			3	-----	42.4	57.6	-----	3.7	5.7	82.2	1.6	6.8	-----	8,300	14,940	-----	-----	-----

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Ultimate. Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLARION COUNTY—Continued.																		
Sligo, 1/8 mile west of; Sligo mine, Brookville bed (200 feet in entry).	3,953	B	1	2.4	37.5	48.9	11.2	4.0	-----	-----	-----	-----	1.1	7,280	13,100	-----	22	-----
			2	-----	38.4	50.2	11.4	4.2	-----	-----	-----	-----	-----	7,467	13,440	-----	-----	-----
¾ mile north of; Shorb pit, Lower Kittanning bed (350 feet in entry).	3,951	B	1	3.4	35.9	52.0	8.7	2.3	-----	-----	-----	-----	1.7	-----	-----	-----	22	-----
2¾ miles southeast of; Saylor county bank, Upper Freeport bed	4,111	B	1	4.0	33.7	54.5	7.8	2.2	-----	-----	-----	-----	2.3	-----	-----	-----	22	-----
Strattonville, 2 miles southeast of: Baldauf No. 1 mine, Lower Kittanning bed	4,116	B	1	2.9	34.5	54.3	8.3	1.4	-----	-----	-----	-----	1.0	-----	-----	-----	22	-----
Upper Hillville, 1½ miles northeast of; Blue Goose mine, Lower Kittanning bed (face of 1 left butt heading, main entry, 700 feet from mine mouth)	34,837	B	1	3.2	38.1	50.1	8.6	3.4	-----	-----	-----	-----	1.4	7,306	13,150	2,210	-----	163
Same (face of 1 left room, 2 left butt heading, main entry, 600 feet from mine mouth)	34,838	B	1	2.9	37.9	50.5	8.7	3.5	-----	-----	-----	-----	1.1	7,300	13,140	2,270	-----	-----
Same (composite of samples 34,837 and 34,838)	34,839	B	1	3.2	37.9	50.0	8.9	3.5	5.3	71.8	1.4	9.1	1.3	7,300	13,140	-----	-----	-----
			2	-----	39.2	51.6	9.2	3.6	5.1	74.2	1.5	6.4	-----	7,544	13,580	-----	-----	-----
			3	-----	43.1	56.9	-----	4.0	5.6	81.6	1.6	7.2	-----	8,306	14,950	-----	-----	-----
West Monterey, 1 1/8 miles east of; Monterey mine, Clarion bed (face of right room, main entry, 7,000 feet from mine mouth)	34,828	B	1	3.5	37.3	51.8	7.4	3.4	-----	-----	-----	-----	1.8	7,439	13,390	2,190	-----	164
Same (face of left room, 2 butt heading, main entry, 6,500 feet from mine mouth)	34,829	B	1	3.8	37.1	51.8	7.3	3.5	-----	-----	-----	-----	2.2	7,417	13,350	2,120	-----	-----
Same (composite of samples 34,828 and 34,829)	34,830	B	1	3.8	37.1	51.6	7.5	3.5	5.4	73.4	1.3	8.9	2.0	7,428	13,370	-----	-----	-----
			2	-----	38.6	53.7	7.7	3.7	5.2	76.2	1.3	5.9	-----	7,717	13,890	-----	-----	-----
			3	-----	41.8	58.2	-----	4.0	5.6	82.6	1.4	6.4	-----	8,367	15,060	-----	-----	-----
CLEARFIELD COUNTY.																		
Berwindale, ½ mile southeast of; Reed mine, Lower Freeport bed (face of room, 150 feet from 4 left entry, 1,400 feet southeast of mine mouth).	22,536	A	1	2.2	25.0	62.1	10.7	3.6	-----	-----	-----	-----	1.7	7,594	13,670	2,100	123	-----

Same (face of 4 left heading, 1,800 feet southeast of mine mouth).	22,535	A	1	2.8	25.7	62.6	8.9	3.0	----	----	----	----	2.1	7,672	13,810	2,100	123	----
Same (face of 3 right back heading, 1,800 feet southwest of mine mouth).	22,537	A	1	2.9	24.2	64.1	8.8	4.3	----	----	----	----	2.2	7,672	13,810	2,260	123	----
Same (face of 4 right heading, 2,200 feet northwest of mine mouth).	22,538	A	1	2.8	23.8	64.1	9.3	3.2	----	----	----	----	2.2	7,650	13,770	2,420	123	----
Same (face of 4 right butt, 4 right heading, 1,800 feet northwest of mine mouth).	22,539	A	1	3.0	25.0	64.1	7.9	2.8	----	----	----	----	2.3	7,750	13,950	2,130	123	----
Same (composite of samples 22,535 to 22,539 inclusive).	22,540	A	1	2.9	24.7	63.3	9.1	3.5	4.9	77.0	1.3	4.2	2.1	7,661	13,790	----	123	----
			2	----	25.4	65.3	9.3	3.6	4.7	79.3	1.3	1.8	----	7,883	14,190	----	----	----
			3	----	28.0	72.0	----	3.9	5.2	87.4	1.5	2.0	----	8,694	15,650	----	----	----
Blain City, ¼ mile east of; Irvona No. 5 mine, Lower Kittanning bed (3 pillar, to right in "Peacock" section).	W17,058	A	1	2.2	21.0	69.3	7.5	1.1	----	----	----	----	----	7,872	14,170	----	123	----
Same (face of 3 room, Rosser heading).	W17,059	A	1	2.8	21.5	68.2	7.5	.8	----	----	----	----	----	7,828	14,090	----	123	----
Same (composite of samples W17,058 and W17,059)	11,703	A	1	1.6	----	----	7.5	1.0	4.7	81.3	1.2	4.3	----	----	----	----	123	----
			2	----	----	----	7.6	1.0	4.6	82.6	1.2	3.0	----	----	----	----	----	----
			3	----	----	----	----	1.0	5.0	89.4	1.3	3.3	----	----	----	----	----	----
Boardman; Potts Run No. 3 mine, Lower Kittanning bed (face of 3 right entry, main entry, 1,400 feet southwest of mine mouth).	12,093	A	1	2.7	20.8	67.8	8.7	1.6	----	----	----	----	2.0	7,722	13,900	2,530	85	----
Same on rib, 10 feet from face of 4 right entry, main entry, 1,700 feet southwest of mine mouth)	12,094	A	1	2.4	20.8	68.1	8.7	1.5	----	----	----	----	1.7	7,750	13,950	2,680	85	----
Same (face of 3 left entry, main entry, 1,680 feet northeast of mine mouth).	12,095	A	1	2.8	20.7	67.6	8.9	1.4	----	----	----	----	2.1	7,717	13,890	3,010	85	----
Same (face of main heading, 2,000 feet north of mine mouth).	12,096	A	1	3.4	20.5	67.7	8.4	1.1	----	----	----	----	2.7	7,700	13,860	3,010	85	----
Same (face of 12 room, 2 right entry, main entry)	12,097	A	1	3.0	21.2	67.0	8.8	1.4	----	----	----	----	2.3	7,700	13,860	3,010	85	----
Same (composite of samples 12,093 to 12,097 inclusive).	12,098	A	1	3.0	21.3	66.9	8.8	1.4	4.7	78.5	1.2	5.4	2.2	7,722	13,900	----	85	----
			2	----	21.9	69.0	9.1	1.4	4.5	80.9	1.2	2.9	----	7,956	14,320	----	----	----
			3	----	24.1	75.9	----	1.5	5.0	89.0	1.4	3.1	----	8,756	15,760	----	----	----
Brisbin, 1 mile southwest of; Lenore No. 1 and 2 mine, Upper Freeport bed (face of left heading, main heading No. 1 drift)	12,046	A	1	3.0	21.6	67.6	7.8	.8	----	----	----	----	1.9	7,789	14,020	2,610	85	----
Same (face of 2 left heading, No. 2 drift).	12,044	A	1	3.1	21.8	66.1	9.0	1.1	----	----	----	----	2.0	7,689	13,840	2,450	85	----
Same (composite of samples 12,044 and 12,046)	12,047	A	1	3.1	21.5	67.2	8.2	.9	4.8	78.5	1.2	6.4	2.0	7,756	13,960	----	85	----
			2	----	22.2	69.3	8.5	1.0	4.6	81.0	1.3	3.6	----	8,006	14,410	----	----	----
			3	----	24.2	75.8	----	1.1	5.0	88.5	1.4	4.0	----	8,744	15,740	----	----	----
Same Lenore No. 2 mine, Upper Freeport bed (face 2 left heading, No. 2 drift).	12,045	A	1	2.8	21.8	67.9	7.5	.9	4.9	79.7	1.3	5.7	1.9	7,883	14,190	2,540	85	----
			2	----	22.4	69.9	7.7	.9	4.7	82.0	1.4	3.3	----	8,111	14,600	----	----	----
			3	----	24.3	75.7	----	1.0	5.1	88.9	1.5	3.5	----	8,789	15,820	----	----	----
Carnwath; Carnwath No. 1 mine, Lower Freeport bed (face of 7 room, 3 right entry, 75 feet from face of entry, 2,100 feet northwest of mine mouth)	20,342	A	1	3.0	24.3	65.0	7.7	1.6	----	----	----	----	2.4	7,772	13,990	2,460	123	----
Same (face of 2 left entry, 1 left entry, 2,400 feet east of mine mouth).	20,343	A	1	3.3	23.9	66.7	6.1	1.4	----	----	----	----	2.5	7,856	14,140	2,390	123	----
Same (composite of samples 20,342 and 20,343).	20,346	A	1	3.1	24.5	65.6	6.8	1.5	5.0	79.7	1.4	5.6	2.5	7,822	14,080	----	123	----
			2	----	25.3	67.7	7.0	1.5	4.8	82.2	1.5	3.0	----	8,078	14,540	----	----	----
			3	----	27.2	72.8	----	1.6	5.1	88.4	1.6	3.3	----	8,683	15,630	----	----	----
Same (west rib of 1 room, 2 left back heading, 3,550 feet northeast of mine mouth).	20,494	A	1	3.5	24.5	66.1	5.9	.7	----	----	----	----	2.8	7,856	14,140	3,010	123	----
			2	----	25.4	68.5	6.1	.7	----	----	----	----	----	8,144	14,660	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLEARFIELD COUNTY—Continued.																		
Same (1 crosscut, 2 room, 2 right heading, 2 left entry, 3,750 feet northwest of mine mouth)	20,495	A	1	3.7	23.9	66.1	6.3	.9	-----	-----	-----	-----	3.0	7,811	14,030	2,590	123	-----
			2	-----	24.8	68.6	6.6	.9	-----	-----	-----	-----	-----	8,667	14,600	-----	-----	-----
Same (west rib of 7 room, 1 right heading, 2 left entry, 3,700 feet northeast of mine mouth)	20,496	A	1	2.8	24.3	66.3	6.6	.9	-----	-----	-----	-----	2.0	7,859	14,130	2,670	123	-----
			2	-----	25.0	68.2	6.8	1.0	-----	-----	-----	-----	-----	8,078	14,540	-----	-----	-----
2½ miles southwest of; Carnwath No. 2 mine, Lower Freeport bed (20 feet from face of 6 right heading, 1,600 feet northeast of mine mouth).	20,338	A	1	2.6	25.6	64.3	7.5	2.6	-----	-----	-----	-----	2.0	7,794	14,030	2,270	123	-----
Same (crosscut, 5 room, 5 left heading, 1,200 feet northeast of mine mouth)	20,339	A	1	2.8	24.4	66.0	6.8	1.8	-----	-----	-----	-----	2.2	7,861	14,150	2,410	123	-----
Same (face of 6 room, 4 right heading, 1,200 feet southeast of mine mouth).	20,340	A	1	3.4	25.3	64.1	7.2	2.6	-----	-----	-----	-----	2.7	7,778	14,000	2,140	123	-----
Same (near face of 1 left heading, 700 feet northwest of mine mouth).	20,341	A	1	2.8	24.9	63.6	8.7	1.8	-----	-----	-----	-----	2.2	7,678	13,820	2,300	123	-----
Same (composite of samples 20,338 to 20,341 inclusive).	20,344	A	1	2.9	25.2	64.4	7.5	2.2	4.9	78.7	1.4	5.3	2.3	7,783	14,010	-----	123	-----
			2	-----	26.0	66.3	7.7	2.3	4.8	81.1	1.4	2.7	-----	8,017	14,430	-----	-----	-----
			3	-----	28.1	71.9	-----	2.4	5.2	87.9	1.5	3.0	-----	8,683	15,630	-----	-----	-----
Clearfield. 1½ miles west of ; MacTavish & Bailey prospect (50 feet in entry).	75,625	B	1	3.0	23.3	69.1	4.6	1.1	-----	-----	-----	-----	2.3	8,067	14,520	2,380	-----	167
			2	-----	24.0	71.2	4.8	1.1	-----	-----	-----	-----	-----	8,311	14,960	-----	-----	-----
Same (another prospect, C bed, 100 feet in entry)	75,626	B	1	3.5	22.1	65.8	8.6	2.4	-----	-----	-----	-----	2.8	7,611	13,700	2,240	-----	167
			2	-----	22.9	68.2	8.9	2.5	-----	-----	-----	-----	-----	7,889	14,200	-----	-----	-----
2½ miles southwest of; Eagle mine, Middle Kittanning bed (face of 1 room, 1 right heading, 500 feet in entry)	75,739	B	1	2.6	21.0	65.0	11.4	2.8	-----	-----	-----	-----	1.8	7,434	13,380	2,260	-----	167
Same (face of 1 right heading, 500 feet in entry)	75,740	B	1	2.1	21.0	65.4	11.5	3.4	-----	-----	-----	-----	1.5	7,406	13,330	2,170	-----	-----
Same (composite of samples 75,739 and 75,740)	75,741	B	1	2.4	21.0	65.2	11.4	3.1	4.6	75.4	1.3	4.2	1.7	7,422	13,360	-----	-----	-----
			2	-----	21.6	66.7	11.7	3.2	4.5	77.3	1.3	2.0	-----	7,606	13,690	-----	-----	-----
			3	-----	24.4	75.6	-----	3.6	5.1	87.5	1.5	2.3	-----	8,611	15,500	-----	-----	-----
Same Lower Freeport bed (face of 1 right heading, 2 right heading, 300 yds. in entry).	75,742	B	1	3.2	22.4	66.5	7.9	2.5	-----	-----	-----	-----	2.4	7,656	13,780	2,290	-----	168
			2	-----	23.1	68.7	8.2	2.6	-----	-----	-----	-----	-----	7,917	14,250	-----	-----	-----

3 miles west of; Cassidy No. 1 mine, Lower Freeport bed (face of main heading, 1,800 feet from mine mouth).	75,620	B	1	2.7	22.7	69.0	5.6	.8	-----	-----	-----	-----	1.9	7,967	14,340	2,850	-----	167
Same (face of 1 left heading, 1,800 feet from mine mouth).	75,621	B	1	2.4	23.7	68.8	5.1	1.0	-----	-----	-----	-----	1.8	8,050	14,490	2,740	-----	-----
Same (composite of samples 75,620 and 75,621), ----	75,622	B	1	2.6	23.0	69.0	5.4	1.0	4.9	81.5	1.5	5.7	1.8	8,028	14,450	-----	-----	-----
			2	-----	23.6	70.9	5.5	1.0	4.8	83.7	1.6	3.4	-----	8,240	14,830	-----	-----	-----
			3	-----	25.0	75.0	-----	1.0	5.0	88.6	1.6	3.8	-----	8,717	15,690	-----	-----	-----
3 miles west of; Schickling mine, Upper Freeport bed (face of main heading, 100 yds. from mine mouth)	75,672	B	1	2.6	24.9	65.8	6.7	.7	-----	-----	-----	-----	1.6	7,856	14,140	2,550	-----	168
				-----	25.6	67.5	6.9	.8	-----	-----	-----	-----	-----	8,072	14,530	-----	-----	-----
Wiley mine, Lower Freeport bed(face of main heading, 400 feet from mine mouth)	75,673	B	1	2.8	24.7	65.2	7.3	1.4	-----	-----	-----	-----	2.0	7,828	14,090	-----	-----	168
			2	-----	25.4	67.1	7.5	1.4	-----	-----	-----	-----	-----	8,056	14,500	-----	-----	-----
Coalport, 2⅓ miles east of; Irvona No. 19 mine, Lower Kittanning bed (face of 2 right entry, main heading)	W17,056	A	1	3.0	21.0	68.0	8.0	.7	-----	-----	-----	-----	-----	7,767	13,980	-----	123	-----
Same (face of 10 face entry, 500 feet off 5 left entry.	W17,057	A	1	2.0	21.5	68.0	8.5	.8	-----	-----	-----	-----	-----	7,822	14,080	-----	123	-----
Same (composite of samples W17,056 and W17,057),	11,702	A	1	1.5	-----	-----	8.1	.8	4.7	80.9	1.2	4.3	-----	-----	-----	-----	123	-----
			2	-----	-----	-----	8.2	.8	4.6	82.1	1.3	3.0	-----	-----	-----	-----	-----	-----
			3	-----	-----	-----	-----	.8	5.0	89.4	1.4	3.4	-----	-----	-----	-----	-----	-----
Curwensville, 1 mile south of; Addleman mine, Upper Freeport bed (face of main heading, 250 yds. from mine mouth).	75,623	B	1	2.1	25.2	63.4	9.3	.7	-----	-----	-----	-----	1.3	7,728	13,910	2,850	-----	169
			2	-----	25.7	64.8	9.5	.7	-----	-----	-----	-----	-----	7,889	14,200	-----	-----	-----
1 mile southeast of; Caldwell m'ne, Lower Freeport b'd (face of 5 right heading, 3,000 feet from mine mouth)	75,619	B	1	2.4	23.1	67.8	6.7	1.0	-----	-----	-----	-----	1.7	7,900	14,220	2,450	-----	169
			2	-----	23.7	69.4	6.9	1.0	-----	-----	-----	-----	-----	8,089	14,560	-----	-----	-----
1½ miles south of; C. O. Norris mine, Lower Kittanning bed (face of main heading, 300 feet from mine mouth)	75,624	B	1															
			2	2.7	22.4	65.3	9.6	1.9	-----	-----	-----	-----	2.2	7,630	13,750	2,390	-----	169
DuBois, 2 miles east of; No. 1 shaft, Upper Freeport bed (face of 1 room, ½ heading, 2 left heading, main south heading).	82,495	B	1	-----	23.0	67.1	9.9	2.0	-----	-----	-----	-----	-----	7,856	14,140	-----	-----	-----
				2.2	29.0	58.1	10.7	1.1	-----	-----	-----	-----	1.7	7,489	13,480	2,200	-----	164
Same (face of 20 room, 2-A heading, 2 left heading, main south heading).	82,496	B	1	2.4	29.2	60.2	8.2	1.0	-----	-----	-----	-----	1.9	7,6 2	13,720	2,220	-----	-----
Same (face of 22 room, 1-D heading, 2-C heading, main west heading).	82,497	B	1	2.0	30.8	60.0	7.2	1.1	-----	-----	-----	-----	1.6	7,772	13,990	2,510	-----	-----
Same (face of crosscut, 47 room, left rib, 2-D heading, 2-C heading, main west heading).	82,498	B	1	2.1	29.1	59.9	8.9	1.8	-----	-----	-----	-----	1.7	7,5 3	13,650	2,340	-----	-----
Same (face of 1 room, 4-C heading, main west heading).	82,499	B	1	1.8	28.4	59.7	10.1	1.4	-----	-----	-----	-----	1.4	7,511	13,520	2,850	-----	-----
Same (composite of sample 82,495 to 82,499 inclusive)	82,500	B	1	2.1	29.4	59.7	8.8	1.3	5.0	76.7	1.4	6.8	1.6	7,611	13,700	-----	-----	-----
			2	-----	30.0	61.0	9.0	1.3	4.9	78.3	1.5	5.0	-----	7,778	14,000	-----	-----	-----
			3	-----	33.0	67.0	-----	1.4	5.3	86.1	1.6	5.6	-----	8,550	15,390	-----	-----	-----
3½ miles south of; Eriton mine, Lower Freeport bed (200 feet southwest of shaft).	17,443	B	1	2.0	31.1	58.2	8.7	2.0	5.0	77.0	1.6	5.7	1.0	7,628	13,730	2,280	123	-----
			2	-----	31.7	59.5	8.8	2.1	4.9	78.5	1.6	4.1	-----	7,783	14,010	-----	-----	-----
			3	-----	34.8	65.2	-----	2.3	5.4	86.1	1.8	4.4	-----	8,530	15,370	-----	-----	-----
Gassam; Gassam No. 1 mine, Lower Freeport bed (face of 9 left entry, 8,000 feet from mine mouth).	8,483	B	1	1.9	23.0	68.9	6.2	1.4	5.0	81.0	1.3	5.1	1.1	7,994	14,390	-----	22	-----
			2	-----	23.5	70.1	6.4	1.4	4.9	82.5	1.1	3.4	-----	8,150	14,670	-----	-----	-----
			3	-----	25.0	75.0	-----	1.5	5.2	88.1	1.5	3.7	-----	8,700	15,660	-----	-----	-----
Graham, ½ mile northwest of; Guion mine, Middle Kittanning bed (end of 4 straight heading, 6,000 feet from mine mouth).	8,484	B	1	2.7	20.0	67.1	10.2	2.0	4.8	76.9	1.3	4.8	1.9	7,561	13,610	-----	22	-----
			2	-----	21.0	68.5	10.5	2.1	4.6	79.0	1.3	2.5	-----	7,761	13,970	-----	-----	-----
			3	-----	23.0	77.0	-----	2.3	5.2	88.2	1.4	2.9	-----	8,672	15,610	-----	-----	-----
Harkley mine, Lower Kittanning bed (room at end of main heading, 7 entry, 2,700 feet from mine mouth)	8,485	B	1	6.2	19.5	65.8	8.1	2.2	5.0	75.1	1.0	7.2	5.5	7,417	13,350	-----	22	-----
			2	-----	20.5	70.5	9.0	3.4	4.6	80.1	1.1	1.8	-----	7,906	14,230	-----	-----	-----
			3	-----	22.5	77.5	-----	3.7	5.1	88.0	1.2	2.0	-----	8,689	15,640	-----	-----	-----

*, †, ‡, §, ¶. See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Moisture.	Proximate. Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLEARFIELD COUNTY—Continued																		
Grampian, ½ mile west of; Grampian No. 3 mine, Lower Freeport bed (face of main heading, 500 feet from mine mouth).	8,482	B	1	4.1	23.0	66.8	6.1	1.9	5.2	78.5	1.1	7.2	3.2	7,778	14,000	-----	22	-----
			2	-----	24.0	69.6	6.4	2.0	5.0	81.8	1.2	3.6	-----	8,111	14,600	-----	-----	-----
			3	-----	26.0	74.0	-----	2.1	5.3	87.4	1.2	4.0	-----	8,667	15,600	-----	-----	-----
Helvetia, 1½ miles west of; Stanley shaft, Lower Freeport bed (left rib, 3 left hole, main slope, 1,000 feet from main slope mouth).	82,501	B	1	2.8	28.4	61.7	7.1	1.2	-----	-----	-----	-----	2.3	7,717	13,890	2,340	-----	164
Same (face of 1 west heading, face heading stump, 500 yds. from shaft)	82,502	B	1	2.6	29.4	61.5	6.5	1.6	-----	-----	-----	-----	2.0	7,800	14,040	2,480	-----	-----
Same (face of 14 butt, 7 east heading, main slope entry)	82,503	B	1	2.6	29.4	58.2	9.8	2.4	-----	-----	-----	-----	2.2	7,456	13,420	2,510	-----	-----
Same (composite of samples 82,501 to 82,503 inclusive)	82,504	B	1	2.7	29.0	60.3	8.0	1.8	5.1	77.4	1.4	6.3	2.2	7,678	13,820	-----	-----	-----
			2	-----	29.8	62.0	8.2	1.8	4.9	79.5	1.4	4.2	-----	7,889	14,200	-----	-----	-----
			3	-----	32.4	67.6	-----	2.0	5.4	86.6	1.6	4.4	-----	8,589	15,460	-----	-----	-----
Houtzdale, 2 miles south of; Mountain Branch mine, Brookville bed (face of 2 left heading, 1,350 feet southeast of mine mouth)	W46,816	A	1	.8	23.3	64.9	11.0	3.5	-----	-----	-----	-----	-----	7,572	13,630	-----	123	-----
Same (face of main heading, 1,350 feet southeast of mine mouth)	W46,817	A	1	5.0	21.6	65.3	8.1	2.8	-----	-----	-----	-----	-----	7,367	13,260	-----	123	-----
Same (face of 1 dip heading, 1 left heading, 1,000 feet east of mine mouth)	W46,818	A	1	1.9	28.6	61.9	12.6	3.3	-----	-----	-----	-----	-----	7,322	13,180	-----	123	-----
Same (face of 3 left heading, 1,400 feet southeast mine mouth)	W46,819	A	1	2.1	22.5	64.0	11.4	3.9	-----	-----	-----	-----	-----	7,383	13,290	-----	123	-----
Same (face of last room, 1 left heading, 1,450 feet southeast of mine mouth)	W46,820	A	1	1.9	23.1	62.8	12.2	4.1	-----	-----	-----	-----	-----	7,378	13,280	-----	123	-----
Same (composite of samples W46,816 to W46,820 inclusive)	19,615	A	1	2.3	22.8	63.9	11.0	3.6	4.4	75.2	1.1	4.7	-----	7,422	13,360	-----	123	-----
			2	-----	23.4	65.3	11.3	3.7	4.3	77.0	1.2	2.5	-----	7,600	13,680	-----	-----	-----
			3	-----	26.3	73.7	-----	4.2	4.8	86.8	1.3	2.9	-----	8,567	15 420	-----	-----	-----
Irvona, ½ mile north of; Glenbrook No. 2 mine, Lower Kittanning bed (face of 6 left heading, 3,000 feet from mine mouth)	75,809	B	1	3.2	21.4	61.6	13.8	1.5	-----	-----	-----	-----	2.6	7,144	12,860	2,840	-----	169

Same (face of room, 6 left heading, 3,000 feet from mine mouth).	75,810	B	1	3.2	22.1	60.6	14.1	1.5					2.6	7,133	12,840	2,740		
Same (composite of samples 74,809 and 75,810),	75,811	B	1	3.2	21.6	61.3	13.9	1.5	4.7	72.5	1.2	6.2	2.6	7,117	12,810			
			2		22.4	63.2	14.4	1.6	4.4	74.8	1.3	3.5		7,350	13,230			
			3		26.1	73.9		1.8	5.2	87.4	1.5	4.1		8,583	15,450			
Karthaus, ½ mile south of; Horseshoe mine, Lower Kittanning bed (face of 3 room, 2 entry, 1,000 feet from mine mouth).	17,441	B	1	2.5	22.4	66.3	8.8	3.2	4.7	78.1	1.4	3.8	1.4	7,661	13,790	2,440	123	
			2		23.0	68.0	9.0	3.2	4.6	80.0	1.4	1.8		7,856	14,140			
			3		25.2	74.8		3.6	5.0	87.9	1.5	2.0		8,628	15,530			
Near; Shinola mine Brookville bed (face of main entry, 600 feet from mine mouth).	17,442	B	1	2.8	20.2	63.9	13.1	3.0	4.7	73.0	1.3	4.9	1.9	7,217	12,990	2,300	123	
			2		20.8	65.7	13.5	3.1	4.5	75.1	1.3	2.5		7,423	13,370			
			3		24.0	76.0		3.6	5.2	86.8	1.5	2.9		8,553	15,450			
1 mile north of; Gonzales No. 1 mine, Lower Freeport bed (face of main heading, 150 ft. from mine mouth)	82,001	B	1	3.9	25.8	63.6	6.7	1.9					3.4	7,733	13,920	2,420		165
Same (left rib, main heading, 75 feet from mine mouth, upper bench).	82,002	B	1	7.1	22.3	63.0	7.6	.5					6.3	7,200	12,960	3,010		
Same (left rib, main heading, 75 feet from mine mouth, lower bench).	82,003	B	1	6.7	22.8	65.5	4.9	.6					6.0	7,489	13,480	3,010		
Same (composite of samples 82,001 to 82,003 inclusive).	82,004	B	1	5.9	23.2	64.4	6.5	1.0	5.1	76.1	1.4	9.9	5.2	7,478	13,460			
			2		24.6	68.5	6.9	1.1	4.8	80.8	1.5	4.9		7,914	14,300			
			3		26.4	73.6		1.1	5.1	86.8	1.6	5.4		8,533	15,360			
La Jose, 1½ miles west of; Clearfield No. 1 mine, Upper Freeport bed (face of 5 heading, 1,700 feet southwest of mine mouth).	5,227	A	1	3.3	24.6	62.7	9.4	2.5					2.1	7,572	13,630		22	
			2		25.4	64.9	9.7	2.6						7,828	14,090			
Same (face of 5 room, 7 heading, 1,700 feet southwest of mine mouth).	5,233	A	1	3.3	23.7	65.1	7.9	1.4					2.1	7,728	13,910		22	
			2		24.5	67.4	8.1	1.4						7,994	14,390			
Luthersburg, ½ mile east of; Luthersburg mine, Lower Kittanning bed (face of 1 left heading, main heading, 1 right heading, main heading).	82,505	B	1	3.5	29.6	56.1	10.8	2.8					3.0	7,300	13,140	2,280		165
Same (composite of samples 82,505 to 82,507 inclusive	82,506	B	1	3.0	30.1	56.5	10.4	2.1					2.4	7,400	13,320	2,360		
Same (face of 15 room, back heading).	82,507	B	1	2.8	28.5	59.9	8.8	2.4					2.3	7,617	13,710	2,340		
Same (composite of samples 82,505 to 82,507 inclusive).	82,508	B	1	3.1	28.7	58.2	10.0	2.5	5.1	74.3	1.4	6.7	2.6	7,444	13,400			
			2		29.6	60.1	10.3	2.6	4.9	76.7	1.4	4.1		7,683	13,830			
			3		33.0	67.0		2.9	5.5	85.5	1.6	4.5		8,567	15,420			
Madera; Sylvania No. 1 mine, Brookville bed (face of 1 right entry, 5,000 feet from mine mouth)	8,490	B	1	2.4	20.5	70.8	6.3	1.7	4.9	80.9	1.4	4.9	1.6	7,961	14,330		22	
			2		21.0	72.6	6.4	1.7	4.7	82.9	1.5	2.8		8,156	14,680			
			3		22.5	77.5		1.8	5.0	88.6	1.6	3.0		8,717	15,690			
1 mile east of; Morgan Run mine, Lower Kittanning bed (face of 4 south entry, 5 right entry)	W20,402	A	1	1.6	18.6	69.4	10.4	2.6						7,678	13,820		85	
			2		18.9	70.5	10.6	2.6						7,860	14,040			
2 miles north of; Bueher mine, Lower Kittanning bed (face of 9 left entry, 1 cross heading, 3,400 feet northeast of mine mouth).	W20,435	A	1	2.3	18.7	68.5	10.5	1.0						7,606	13,690		85	
Same (face of 8 right heading, 3,800 feet northeast of main heading).	W20,436	A	1	2.1	20.0	68.9	9.0	1.5						7,767	13,980		85	
Same (face of 10 right heading, 4,500 feet northeast of mine mouth).	W20,437	A	1	2.4	19.9	68.2	9.5	1.2						7,700	13,860		85	
Same (face of 7 left heading, 3,000 feet northeast of mine mouth).	W20,438	A	1	2.3	19.5	70.2	8.0	1.2						7,839	14,110		85	
Same (face of 7 right heading, 3,200 feet northeast of mine mouth).	W20,439	A	1	2.3	20.4	69.0	8.3	1.2						7,756	13,960		85	
Same (composite of samples W20,435 to W20,439)	12,376	A	1	.8	21.4	68.4	9.4	1.4	4.5	80.1	1.1	3.6		7,789	14,020		85	
			2		21.5	69.1	9.4	1.4	4.4	80.7	1.1	2.9		7,856	14,140			
			3		23.8	76.2		1.5	4.9	89.1	1.2	3.2		8,672	15,610			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLEARFIELD COUNTY—Continued																		
Same (face of 3 east entry, 5 right entry),	W20,403	A	1	1.9	19.1	68.5	10.5	1.8						7,606	13,690		85	
Same (face of 3 south entry, 5 right entry),	W20,404	A	1	2.0	18.2	67.4	12.4	3.2						7,411	13,340		85	
Same (face of 1 south entry, 5 right entry),	W20,405	A	1	2.0	18.7	68.3	11.0	3.3						7,550	13,590		85	
Same (face of main heading),	W20,406	A	1	1.9	17.3	70.5	10.3	3.5						7,589	13,660		85	
Same (composite of samples W20,403 to W20,406 inclusive).	12,368	A	1	.8	20.4	67.9	10.9	3.1	4.3	77.6	1.1	3.0		7,628	13,730		85	
			2		20.6	68.4	11.0	3.1	4.3	78.3	1.1	2.2		7,694	13,850			
			3		23.1	76.9		3.5	4.8	87.9	1.2	2.6		8,644	15,560			
Mahaffey, ¼ mile south of; Mahaffey mine, Lower Freeport bed (100 feet from air shaft).	75,734	B	1	2.9	26.4	62.4	8.3	1.6					1.7	7,611	13,700	2,510		170
			2		27.1	64.4	8.5	1.6						7,833	14,100			
McGees Mills, ½ mile south of; Butter Ball mine, Middle Kittanning bed, (face of main heading, 500 feet from mine mouth).	75,671	B	1	2.8	26.8	58.0	12.4	5.1					2.2	7,250	13,050	2,150		170
			2		27.6	59.6	12.8	5.2						7,456	13,420			
Sherwood mine, Upper Kittanning bed (face of main heading, 200 feet from mine mouth).	75,674	B	1	5.6	26.0	60.3	8.1	1.3					4.6	7,378	13,280	2,620		170
			2		27.5	63.9	8.6	1.4						7,811	14,060			
Morrisdale; Morrisdale No. 1 mine, Middle Kittanning bed (face of sump heading, 3,00 feet from shaft No. 1).	12,079	A	1	3.5	20.5	67.3	8.7	1.1					2.8	7,644	13,760	3,070	85	
Same (face of McKinley heading, Truck main heading, 5,850 feet from shaft No. 1).	12,080	A	1	4.2	19.7	67.6	8.5	1.1					3.1	7,556	13,600	2,850	85	
Same (composite of samples 12,079 and 12,080),	12,082	A	1	3.9	19.8	67.5	8.8	1.1	4.9	77.4	1.3	6.5	3.0	7,567	13,620		85	
			2		20.6	70.2	9.2	1.1	4.6	80.6	1.3	3.2		7,867	14,160			
			3		22.7	77.4		1.2	5.1	88.7	1.5	3.5		8,661	15,590			
Same Lower Kittanning bed (face of main heading 5,240 feet from shaft No. 1).	12,074	A	1	4.2	20.0	66.8	9.0	3.8					3.7	7,528	13,550	2,230	85	
Same (face of 13 room, 8 right heading, main heading, 5,040 feet from shaft No. 1).	12,075	A	1	3.2	19.6	69.2	8.0	3.4					2.7	7,722	13,900	2,320	85	
Same (face 45 room, 4 right entry, main heading, 5,200 feet from shaft No. 1).	12,081	A	1	3.2	21.9	67.2	7.7	3.1					2.7	7,744	13,940	2,300	85	
Same (composite of samples 12,074, 12,075 and 12,081)	12,090	A	1	3.6	20.9	67.0	8.5	3.4	4.9	77.1	1.3	4.8	3.0	7,678	13,820		85	
			2		21.6	69.6	8.8	3.5	4.7	80.0	1.3	1.7		7,967	14,340			
			3		23.7	76.3		3.9	5.1	87.7	1.5	1.8		8,733	15,720			

Morrisdale No. 2 mine, Middle Kittanning bed (face of 6 heading, 4,500 feet from shaft No. 2).	12,072	A	1	3.0	19.4	67.4	10.2	1.0					2.3	7,550	13,590	2,980	85	
Same (face of 9 room, 2 left heading off Lucky strike, 2,200 feet from shaft No. 2).	12,073	A	1	2.5	20.7	67.0	9.8	1.7					2.0	7,639	13,750	2,620	85	
Same (composite of samples 12,072 and 12,073),	12,091	A	1	2.8	20.3	66.9	10.0	1.3	4.7	77.1	1.3	5.6	2.2	7,578	13,640		85	
			2		20.9	68.8	10.3	1.4	4.5	79.3	1.3	3.2		7,800	14,040			
			3		23.3	76.7		1.5	5.0	88.3	1.4	3.8		8,694	15,650			
Morrisdale No. 3 mine, Lower Kittanning bed (face of 5 room, 1 left heading, new slope tunnel, 1,400 feet from No. 3 shaft).	12,076	A	1	3.2	19.7	69.8	7.3	2.0					2.6	7,806	14,050	2,500	85	
Same (face of shaft No. 2 heading, main dip, 5,500 feet from shaft).	12,077	A	1	3.3	19.2	71.1	6.4	1.7					2.8	7,900	14,220	2,550	85	
Same (face of Morrisdale heading, 6,300 feet from shaft).	12,078	A	1	3.2	19.8	70.0	7.0	2.0					2.7	7,861	14,150	2,660	85	
Same composite of samples 12,076 to 12,078 inclusive).	12,092	A	1	3.3	20.1	69.6	7.0	1.9	4.7	79.9	1.4	5.1	2.7	7,861	14,150		85	
			2		20.8	72.0	7.2	2.0	4.4	82.7	1.4	2.3		8,128	14,630			
			3		22.5	77.5		2.1	4.8	89.1	1.5	2.5		8,767	15,780			
Moshannon, ½ mile north of; Lower Freeport bed (pillars of a small mine, 500 feet in entry, close to big fault).	8,488	B	1	2.9	20.5	72.0	4.6	.8	5.0	82.8	1.4	5.4	2.1	8,061	14,510		22	
			2		21.5	73.8	4.7	.8	4.8	85.3	1.4	3.0		8,250	14,850			
			3		22.5	77.5		.8	5.1	89.5	1.5	3.1		8,717	15,690			
¾ mile southeast of; Union No. 2 mine, Brookville bed (face of 2 left entry, main entry, 1,000 feet from mine mouth).	8,480	B	1	2.8	20.7	67.6	8.9	2.9	5.0	77.6	1.0	4.6	1.9	7,672	13,810		22	
			2		21.3	69.5	9.2	2.9	4.8	79.8	1.0	2.3		7,889	14,200			
			3		23.5	76.5		3.2	5.3	87.9	1.1	2.5		8,683	15,630			
Munson; Colorado No. 5 mine, Lower Kittanning bed (face of 6 entry, line heading).	12,109	A	1	3.7	19.8	69.7	6.8	1.7					2.7	7,833	14,100	2,650	85	
Same (face of 8 left entry, main heading, 3,000 feet from mine mouth).	12,110	A	1	3.6	20.3	69.2	6.9	1.8					2.7	7,833	14,100	2,560	85	
Same (face of main heading, 3,000 feet from mine mouth).	12,111	A	1	3.3	20.0	69.4	7.3	1.6					2.4	7,817	14,070	3,000	85	
Same (face of line heading),	12,112	A	1	3.3	19.9	68.3	8.5	2.9					2.5	7,680	13,810	2,[illegible]0	85	
Same (face of 6 left heading, main heading),	12,113	A	1	3.4	19.4	68.8	8.4	2.0					2.4	7,672	13,810	2,500	85	
Same (composite of samples 21,109 to 12,113 inclusive).	12,114	A	1	3.3	19.9	69.0	7.8	2.0	4.8	79.0	1.3	5.1	2.5	7,789	14,020		85	
			2		20.6	71.3	8.1	2.1	4.6	81.6	1.4	2.2		8,050	14,490			
			3		22.4	77.6		2.3	5.0	88.8	1.5	2.4		8,756	15,760			
Ghem mine, Lower Kittanning bed (face of 9 right heading).	26,306	A	1	2.9	23.0	64.7	9.4	2.7					2.5	7,611	13,700	2,470	193	
Same (20 feet from face of 2 main entry),	26,307	A	1	3.7	22.0	64.6	9.7	3.2					3.3	7,494	13,490	2,300	193	
Same (face of 2 room, 3 right back heading),	26,308	A	1	2.6	21.6	63.0	9.8	3.2					2.2	7,578	13,640	2,300	193	
Same (25 feet from face of 8 right heading),	26,309	A	1	2.8	22.8	65.6	8.8	3.0					2.3	7,614	13,700	2,310	193	
Same (composite of samples 26,306 to 26,309 inclusive).	26,310	A	1	3.0	22.8	64.7	9.5	3.1	4.7	76.7	1.3	4.7	2.6	7,572	13,630		193	
			2		23.6	66.6	9.8	3.2	4.5	79.1	1.4	2.0		7,806	14,050			
			3		26.1	73.9		3.5	5.0	87.7	1.5	2.3		8,656	15,580			
Same (face of 2 room, 3 right back heading, roof coal).	26,311	A	1	2.0	23.9	55.2	18.9	6.4					1.6	6,756	12,160	2,060	193	
			2		24.3	56.4	19.3	6.6						6,894	12,410			
Same (25 feet from face of 8 right heading, roof coal).	26,312	A	1	2.6	21.4	58.0	18.0	7.6					2.3	6,756	12,160	2,030	193	
			2		22.0	59.5	18.5	7.8						6,933	12,480			
Same (face of 14 room, 9 right heading, 2 drift),	81,672	B	1	2.1	23.0	64.5	10.4	3.4					1.5	7,506	13,510	2,240		166
Same (face of 16 room, 10 left heading, 2 drift),	81,673	B	1	2.1	21.2	66.6	10.1	3.2					1.6	7,572	13,630	2,390		
Same (left rib of 16 room, 10 right heading, 1 drift 10 feet from face).	81,674	B	1	2.5	22.1	66.0	9.4	2.7					1.7	7,583	13,650	2,510		

*, †, ‡, §, ¶, See footnote page 17

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLEARFIELD COUNTY—Continued																		
Same (right rib of 6 room, 11 right heading, 1 drift, 30 feet from face).	81,675	B	1	2.7	21.4	68.7	7.2	2.4					2.0	7,800	14,040	2,620		
Same composite of samples 81,672 to 81,675 inclusive).	81,676	B	1	2.5	21.7	66.4	9.4	2.9	4.7	77.5	1.3	4.2	1.7	7,639	13,750			
			2		22.3	68.1	9.6	2.9	4.5	79.5	1.3	2.2		7,833	14,100			
			3		24.7	75.3		3.2	5.0	87.9	1.5	2.4		8,672	15,610			
Osceola Mills, 3 miles west of; Fairmount No. 2 mine, Lower Freeport bed (face of 5 room, 2 left heading).	W17,010	A	1	3.1	21.0	69.7	6.2	1.6						7,861	14,150		85	
Same (face of 14 room, 8 right heading),	W17,012	A	1	2.4	22.5	68.8	6.3	1.0						7,967	14,340		85	
Same (composite of samples W17,010 and W17,012),	11,711	A	1	1.8			6.4	1.3	4.7	81.7	1.3	4.6					85	
			2				6.6	1.3	4.6	83.2	1.3	3.0						
			3					1.4	4.9	89.1	1.4	3.2						
Philipsburg, (Centre County), 2 miles west of; Guion mine heading, Lower Kittanning bed, (face of 1 right heading, 2 right entry, 4,000 feet from mine mouth).	W20,369	A	1	2.0	20.0	69.9	8.1	1.1						7,828	14,090		85	
Same (face of 2 right heading, 4,000 feet from mine mouth).	W20,370	A	1	2.0	21.5	69.2	7.3	1.0						7,903	14,230		85	
Same (back heading, 1 right entry, 2,500 feet from mine mouth).	W20,371	A	1	2.9	18.4	69.1	9.6	2.2						7,600	13,680		85	
Same (50 feet from face of 1 left heading, 2 right entry).	W20,372	A	1	2.0	19.2	70.1	8.7	1.5						7,789	14,020		85	
Same (face of 1 left heading, 1 right entry, 2,200 feet from mine mouth).	W20,373	A	1	2.4	19.6	67.5	10.5	1.9						7,539	13,570		85	
Same (composite of samples W20,369 to W20,373 inclusive).	12,367	A	1	.9	21.6	68.5	9.0	2.0	4.6	79.5	1.3	3.6		7,811	14,060		85	
			2		21.8	69.1	9.1	2.0	4.5	80.2	1.3	2.9		7,883	14,190			
			3		24.0	76.0		2.2	5.0	88.2	1.5	3.1		8,672	15,610			
2½ miles northwest of; Conquest mine, Middle Kittanning bed (face of 1 left heading, 250 yds. from mine mouth).	75,731	B	1	3.9	21.1	69.0	6.0	2.3					2.8	7,822	14,080	2,370		170
			2		22.0	71.7	6.3	2.4						8,139	14,650			
Same Lower Freeport bed (face of main heading, 300 yds. from mine mouth).	75,732	B	1	3.6	23.3	67.8	5.3	.9					2.3	7,911	14,240	2,620		
			2		24.2	70.3	5.5	1.0						8,200	14,760			

Same Upper Freeport bed (face of main entry, 500 feet from mine mouth).	75,733	B	1	4.2	23.9	63.4	8.5	1.0	----	----	----	----	3.2	7,594	13,670	2,540	----	----
			2	----	25.0	66.1	8.9	1.0	----	----	----	----	----	7,928	14,270	----	----	----
3⅓ miles southwest of; Acme No. 2 mine, Lower Kittanning bed (face of 3 left heading, Hawk Run entry, ½ mile southwest of mine mouth).	10,258	A	1	3.8	19.6	69.3	7.3	2.5	----	----	----	----	3.4	7,733	13,920	2,430	22	----
Same (last room, 1 left entry, Hawk Run entry, 3/8 mile southwest of mine mouth).	10,259	A	1	2.8	19.7	69.8	7.7	2.2	----	----	----	----	2.3	7,800	14,040	----	22	----
Same (composite of samples 10,258 and 10,259)	10,264	A	1	3.4	19.9	69.2	7.5	2.4	4.8	78.9	1.3	5.1	2.9	7,750	13,950	----	22	----
			2	----	20.5	71.7	7.8	2.5	4.6	81.7	1.3	2.1	----	8,018	14,430	----	----	----
			3	----	22.3	77.7	----	2.7	5.0	88.6	1.4	2.3	----	8,696	15,650	----	----	----
Same (pillar in 1 room, Packer heading, ⅔ mile northeast of mine mouth).	10,260	A	1	2.3	20.6	69.7	7.4	1.5	----	----	----	----	1.7	7,900	14,220	----	22	----
Same (pillar in 1 room, 3 left entry, Lucky 2½ entry, ¾ mile northeast of mine mouth).	10,261	A	1	3.1	20.2	69.2	7.5	2.0	----	----	----	----	2.5	7,778	14,000	----	22	----
Same (composite of samples 10,260 and 10,261)	10,265	A	1	2.8	20.2	69.6	7.4	1.7	5.0	79.9	1.3	4.7	2.1	7,822	14,080	----	22	----
			2	----	20.8	71.6	7.6	1.7	4.8	82.2	1.4	2.3	----	8,050	14,490	----	----	----
			3	----	22.5	77.5	----	1.9	5.2	88.9	1.5	2.5	----	8,711	15,680	----	----	----
Smoke Run ⅓ mile west of; Eureka No. 22 mine, Lower Freeport bed (face of 1 west entry, main heading, 2,600 feet from mine mouth, lower split of bed)	8,489	B	1	3.2	21.0	69.3	6.5	.7	4.9	79.9	1.3	6.7	2.2	7,811	14,060	----	22	----
				----	22.0	71.3	6.7	.7	4.7	82.5	1.4	4.0	----	8,072	14,530	----	----	----
				----	23.5	76.5	----	.8	5.0	88.4	1.5	4.3	----	8,650	15,570	----	----	----
3⅓ miles southeast of; Viola mine, Lower Kittanning bed (face of 9 left heading, beyond 18 room, 1,300 feet from main haulage-way)	11,748	A	1	3.8	20.4	68.9	6.9	1.1	----	----	----	----	3.1	7,811	14,060	3,010	85	----
Same (face of second slant to right, just beyond 3 room)	11,749	A	1	3.7	20.4	68.8	7.1	.9	----	----	----	----	2.9	7,822	14,080	2,640	85	----
Same (face of main entry, 4,750 feet southwest of mine mouth)	11,750	A	1	3.7	20.3	67.6	8.4	1.2	----	----	----	----	2.9	7,706	13,870	2,600	85	----
Same (composite of samples 11,748 to 11,750 inclusive)	11,751	A	1	3.7	20.3	68.4	7.6	1.3	4.9	78.9	1.2	6.1	3.0	7,761	13,970	----	85	----
			2	----	21.1	71.0	7.9	1.4	4.6	82.0	1.3	2.8	----	8,061	14,510	----	----	----
			3	----	22.9	77.1	----	1.5	5.0	89.0	1.4	3.1	----	8,750	15,750	----	----	----
Same (near face of 10 left entry, 100 ft. from 12 room)	W18,355	A	1	3.0	19.6	70.3	7.1	.8	----	----	----	----	----	7,822	14,080	----	85	----
Same (near face of third slant entry, 100 feet above 1 room)	W18,356	A	1	3.0	19.2	69.7	8.1	1.6	----	----	----	----	----	7,767	13,980	----	85	----
Same (near face of 9 left heading)	W18,357	A	1	3.4	19.5	70.4	6.7	1.0	----	----	----	----	----	7,867	14,160	----	85	----
Same (face of main entry, 4,800 feet southwest of mine mouth)	W18,358	A	1	3.3	19.0	69.7	8.0	1.6	----	----	----	----	----	7,711	13,880	----	85	----
Same (face of second slant entry, 100 feet above third slant entry)	W18,359	A	1	3.3	19.0	70.2	7.5	1.0	----	----	----	----	----	7,833	14,100	----	85	----
Surveyor, ¼ mile west of; Croft mine, Upper Freeport bed (face of 8 room, 1 left heading)	75,551	B	1	2.6	26.1	62.8	8.5	1.1	----	----	----	----	1.7	7,694	13,850	2,530	----	----
Same (face of 4 right heading)	75,552	B	1	3.2	26.0	63.3	7.5	.9	----	----	----	----	2.0	7,700	13,860	2,000	----	----
Same (composite of samples 75,551 and 75,552)	75,553	B	1	2.9	25.9	63.3	7.9	1.1	5.0	76.5	1.4	8.1	1.8	7,694	13,850	----	----	----
			2	----	26.7	65.2	8.1	1.1	4.8	78.8	1.5	5.7	----	7,922	14,260	----	----	----
			3	----	29.0	71.0	----	1.2	5.3	85.8	1.6	6.1	----	8,617	15,510	----	----	----
½ mile north of; Goshen No. 2 mine, Lower Kittanning bed (100 feet in main heading)	75,548	B	1	2.9	27.1	60.8	9.2	2.8	----	----	----	----	2.2	7,578	13,640	2,130	----	171
Same Lower Freeport bed, (300 yds. in main heading)	75,549	B	1	3.5	25.6	64.3	6.6	1.9	----	----	----	----	2.5	7,756	13,960	2,210	----	----
Same (composite of samples 75,548 and 75,549)	75,550	B	1	3.3	26.2	62.6	7.9	2.4	5.0	77.1	1.2	6.4	2.3	7,678	13,820	----	----	----
			2	----	27.1	64.7	8.2	2.4	4.8	79.7	1.2	3.7	----	7,933	14,280	----	----	----
			3	----	29.5	70.5	----	2.7	5.2	86.8	1.4	3.9	----	8,644	15,560	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLEARFIELD COUNTY—Continued.																		
Winburne, 1½ miles north of; Ogle No. 9 mine, Lower Kittanning bed (face of 4 right heading, G heading)	81,746	B	1	2.5	22.2	68.9	6.4	1.7	-----	-----	-----	-----	2.0	7,900	14,220	2,620	-----	166
Same (face of 4 room, 3 left heading, G heading)	81,747	B	1	2.9	21.8	68.0	7.3	2.5	-----	-----	-----	-----	2.3	7,761	13,970	2,340	-----	-----
Same (face of main B heading)	81,748	B	1	2.8	22.3	66.2	8.7	3.1	-----	-----	-----	-----	2.4	7,694	13,850	2,450	-----	-----
Same (face of C-2 heading, main A heading)	81,749	B	1	3.0	21.2	67.8	8.0	3.0	-----	-----	-----	-----	2.6	7,689	13,840	2,390	-----	-----
Same (left rib, 40 feet from face of 4 room, 3 right main heading)	81,750	B	1	3.1	22.3	67.5	7.1	2.8	-----	-----	-----	-----	2.7	7,756	13,960	2,540	-----	-----
Same (left rib, 50 feet from face of 24 room, 7 north entry, 3 right heading)	81,751	B	1	3.6	21.3	68.1	7.1	1.9	-----	-----	-----	-----	3.1	7,672	13,810	2,450	-----	-----
Same (composite of samples 81,746 to 81,751 inclusive)	81,752	B	1	3.0	21.7	67.9	7.4	2.6	4.9	78.9	1.4	4.8	2.5	7,744	13,940	-----	-----	-----
			2	-----	22.4	70.0	7.6	2.7	4.7	81.3	1.4	2.3	-----	7,978	14,360	-----	-----	-----
			3	-----	24.2	75.8	-----	2.9	5.1	88.0	1.6	2.4	-----	8,633	15,540	-----	-----	-----
Woodland, ½ mile southwest of; Plane mine, Upper Kittanning bed (face of 1 right entry, 1 right heading)	8,486	B	1	3.2	23.5	65.8	7.5	3.8	4.9	77.7	1.2	4.9	2.6	7,744	13,940	-----	22	-----
			2	-----	24.5	67.7	7.8	3.9	4.7	80.2	1.3	2.1	-----	7,994	14,[illegible]	-----	-----	-----
			3	-----	26.5	73.5	-----	4.2	5.1	86.9	1.4	2.4	-----	8,667	15,600	-----	-----	-----
CLINTON COUNTY.																		
Bitumen, 3 miles northwest of; Kettle Creek mine No. 8, Lower Kittanning bed (face of 8 room, 2 right heading, 3 left heading).	82,005	B	1	3.3	20.8	66.1	9.8	3.7	-----	-----	-----	-----	2.9	7,561	13,610	2,240	-----	172
Same (face of 10 room, 1 right heading, 3 left heading).	82,006	B	1	3.0	20.8	67.6	8.6	3.3	-----	-----	-----	-----	2.8	7,591	13,670	2,200	-----	-----
Same (face of 3 left heading)	82,007	B	1	3.2	21.9	65.0	9.9	3.3	-----	-----	-----	-----	2.8	7,433	13,[illegible]	2,220	-----	-----
Same (composite of samples 82,005 to 82,007 inclusive)	82,008	B	1	3.2	21.8	65.6	9.4	3.4	4.7	76.3	1.2	5.0	2.8	7,517	13,5[illegible]	-----	-----	-----
			2	-----	22.5	67.8	9.7	3.5	4.5	78.8	1.2	2.3	-----	7,767	13,980	-----	-----	-----
			3	-----	24.9	75.1	-----	3.9	5.0	87.2	1.4	2.5	-----	8,000	15,480	-----	-----	-----

Lock Haven, 17 miles west of; Scottac mine, Brookville bed (face of 1 left heading, 500 yds. from entrance).	75,465	B	1	2.9	18.3	59.1	19.7	.6					1.6	6,528	11,750	3,000	
Same (face of 2 left heading, 400 yds. from entrance).	75,464	B	1	2.4	21.7	63.2	12.7	.7					1.5	7,300	13,140	3,000	172
Same (composite of samples 75,465 and 75,464)	75,466	B	1	2.7	20.4	60.7	16.2	.7	4.3	71.2	1.1	6.5	1.6	6,894	12,410		
			2		20.9	62.4	16.7	.7	4.1	73.1	1.1	4.3		[illegible]	13,750		
			3		25.1	74.9		.8	4.9	87.7	1.4	5.2		8,500	15,300		
ELK COUNTY																	
Averyville; Star mine, 3-foot bed (face of 1 right heading, 600 feet from entrance.	34,975	B	1	2.0	30.9	48.5	18.6	4.7					1.1	6,550	11,790	2,480	172
Same (face of 2 right heading, 700 feet from entrance).	34,976	B	1	2.6	31.8	46.3	19.3	4.8					1.8	6,406	11,530	2,500	
Same (composite of samples 34,975 and 34,976)	34,977	B	1	2.4	31.6	46.9	19.1	4.8	4.7	64.1	1.1	6.2	1.4	6,494	11,690		
			2		32.3	48.1	19.6	4.9	4.6	65.6	1.1	4.2		6,650	11,970		
			3		40.2	59.8		6.1	5.7	81.6	1.4	5.2		8,267	14,880		
Bennezette, 2 miles north of; Winslow mine, Lower Kittanning bed (500 feet in entry).	75,348	B	1	3.4	31.1	59.1	6.4	2.9					2.4	7,822	14,080	2,250	
Same (500 feet in entry)	75,349	B	1	3.2	31.6	58.5	6.7	3.0					2.1	7,778	14,000	2,310	173
Same (composite of samples 75,348 and 75,349)	75,350	B	1	3.2	31.6	58.7	6.5	2.9	5.3	77.9	1.2	6.2	2.3	7,811	14,060		
			2		32.6	60.7	6.7	3.0	5.1	80.4	1.3	3.5		8,066	14,520		
			3		35.0	65.0		3.3	5.5	86.2	1.3	3.7		8,644	15,560		
Benzinger; West Branch mine, Middle Kittanning bed (face of main heading, ½ mile from mine mouth)	34,989	B	1	2.5	29.7	51.1	16.7	1.9					1.5	6,756	12,160	2,680	173
Same (face of 1 left heading, ¼ mile from mine mouth).	34,990	B	1	2.2	32.0	48.7	17.1	2.2					1.2	6,761	12,170	2,720	
Same (composite of samples 34,989 and 34,990)	34,991	B	1	2.3	30.9	49.9	16.9	2.1	4.7	68.1	1.1	7.1	1.4	6,766	12,160		
			2		31.6	51.1	17.3	2.1	4.5	69.7	1.1	5.3		6,917	12,450		
			3		38.2	61.8		2.6	5.5	84.2	1.4	6.3		8,367	15,060		
Brandy Camp; Elbon No. 5 mine, Lower Kittanning bed (face of 1 left entry, 4 drift, 1,000 feet from mine mouth)	17,458	B	1	2.7	33.7	54.9	8.7	2.9					1.0	7,483	13,470	2,140	123	
			2		34.6	56.5	8.9	3.0						7,689	13,840			
Byrnedale; Byrnedale No. 31 mine, Lower Kittanning bed (face of 1 left entry, main entry, 600 feet from mine mouth).	17,456	B	1	2.7	32.4	58.6	6.3	2.5	5.2	78.1	1.5	6.4	1.3	7,789	14,020	2,350	123	
			2		33.3	60.2	6.5	2.6	5.1	80.3	1.5	4.0		8,000	14,400			
			3		35.6	64.4		2.8	5.4	85.8	1.6	4.4		8,556	15,400			
Dagus; Dagus mine, Lower Kittanning bed (in room, off 1 right face entry, 1 mile from mine mouth)	17,455	B	1	2.9	34.7	52.7	9.7	3.9	5.2	72.7	1.4	7.1	1.5	7,378	13,280	2,240	123	
			2		35.7	54.3	10.0	4.0	5.0	74.9	1.5	4.6		7,600	13,680			
			3		39.6	60.4		4.5	5.6	83.1	1.6	5.2		8,444	15,200			
Force, 2 miles west of; Proctor No. 1 mine, Lower Kittanning bed (face of 4 right heading, ⅜ mile from mine mouth).	75,351	B	1	2.4	31.0	59.9	6.7	2.3					1.5	7,814	14,120	2,310		173
Same (face of 4 left heading, ⅜ mile from mine mouth)	75,352	B	1	2.9	30.7	60.0	5.8	2.0					2.1	7,861	14,150	2,350		
Same (face of 3 right heading, 19 room, ¼ mile from mine mouth).	75,353	B	1	2.5	32.0	60.0	5.5	1.8					1.7	7,939	14,290	2,440		
Same (composite of samples 75,351 to 75,353 inclusive).	75,354	B	1	2.7	30.5	60.9	5.9	2.0	5.3	78.8	1.3	6.7	1.8	7,861	14,150			
			2		31.4	62.6	6.0	2.0	5.1	81.0	1.3	4.6		8,078	14,540			
			3		33.4	66.6		[illegible]	5.5	86.2	1.4	4.7		8,594	15,470			
Wilmere; Dents Run No. 1 mine, Lower Kittanning bed (face of 4 left entry, 600 feet from mine mouth)	17,457	B	1	3.1	30.6	56.9	9.4	3.5					1.8	7,439	13,390	2,050	123	
			2		31.6	58.7	9.7	3.6						7,678	13,820			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FAYETTE COUNTY.																		
Belbois Station; Belbois mine, Waynesburg bed (right rib fan way, 20 feet from outcrop, lower part of bed).	84,987	B	1	3.2	33.0	53.1	10.7	1.4	-----	-----	-----	-----	2.7	7,100	12,780	2,370	-----	174
			2	-----	34.1	54.9	11.0	1.5	-----	-----	-----	-----	-----	7,333	13,200	-----	-----	-----
Cherry Camp mine, Waynesburg bed (face of main entry, 30 feet from outcrop, upper part of bed).	84,986	B	1	3.9	32.4	49.7	14.0	1.3	-----	-----	-----	-----	3.5	6,833	12,300	2,850	-----	174
			2	-----	33.7	51.7	14.6	1.3	-----	-----	-----	-----	-----	7,111	12,800	-----	-----	-----
Cheat Haven, ½ mile west of; Eagle mine, Pittsburgh bed (face of 4 room, 2 left butt entry, 35 face entry).	84,588	B	1	3.0	33.9	56.7	6.4	1.7	-----	-----	-----	-----	2.5	7,600	13,860	2,480	-----	175
Same (face of 8 room, 2 left butt entry, 35 face entry)	84,589	B	1	2.5	33.8	55.6	8.1	2.4	-----	-----	-----	-----	2.0	7,588	13,660	2,340	-----	-----
Same (face of 17 room, 2 right butt entry, 35 face entry).	84,590	B	1	2.3	36.0	54.4	7.3	2.6	-----	-----	-----	-----	1.8	7,675	13,820	2,280	-----	-----
Same (face of 1 right butt entry, 35 face entry).	84,591	B	1	2.5	34.9	53.6	9.0	2.5	-----	-----	-----	-----	2.0	7,502	13,520	2,340	-----	-----
Same (composite of samples 84,588 to 84,591 inclusive).	84,592	B	1	2.6	35.2	54.4	7.8	2.3	5.3	76.0	1.6	7.0	2.1	7,619	13,710	-----	-----	-----
			2	-----	36.1	55.9	8.0	2.4	5.2	78.0	1.6	4.8	-----	7,820	14,070	-----	-----	-----
			3	-----	39.2	60.8	-----	2.6	5.6	84.7	1.7	5.4	-----	8,497	15,290	-----	-----	-----
Connellsville, 2 miles southwest of; Leisenring mine, Pittsburgh bed (6,500 ft. northwest of mine mouth)	4,411	A	1	2.4	29.9	60.5	7.2	1.0	-----	-----	-----	-----	1.4	-----	-----	-----	22	-----
Same (9,000 feet northwest of mine mouth).	4,412	A	1	2.8	30.0	59.8	7.4	1.2	-----	-----	-----	-----	1.8	7,772	13,990	-----	22	-----
Same (face of 6 butt entry, 7 rib, 2½ miles south of mine mouth).	7,594	A	1	2.7	28.7	60.3	8.3	.7	-----	-----	-----	-----	1.6	7,572	13,630	-----	22	-----
Same (2 butt parallel entry, 6 right entry, 7,500 feet north of mine mouth).	5,236	A	1	3.2	27.1	62.6	7.1	1.0	5.2	78.0	1.2	7.5	1.8	7,733	13,920	-----	22	-----
			2															
			3	-----	28.0	64.6	7.4	1.0	5.0	80.6	1.3	4.7	-----	7,994	14,390	-----	-----	-----
Dunbar, ½ mile east of; Ainsley mine, Lower Freeport bed (face of room, main entry, 75 yds. from mine mouth).	81,339	B	1	-----	30.3	69.7	-----	1.1	5.4	87.0	1.4	5.1	-----	8,628	15,530	-----	-----	-----
				3.0	28.5	55.7	12.8	1.1	-----	-----	-----	-----	1.8	7,122	12,820	2,850	-----	175
Same (face of room, main entry, 60 yds. from mine mouth).	81,340	B	1	3.5	27.3	56.4	12.8	1.4	-----	-----	-----	-----	2.3	7,078	12,740	2,680	-----	-----
Same (composite of samples 81,339 and 81,340).	81,341	B	1	3.0	27.6	56.5	12.9	1.2	4.9	72.1	1.3	7.6	2.0	7,106	12,790	-----	-----	-----
			2	-----	28.5	58.2	13.3	1.3	4.7	74.4	1.4	4.9	-----	7,328	13,190	-----	-----	-----
			3	-----	32.8	67.2	-----	1.4	5.4	85.8	1.6	5.8	-----	8,450	15,210	-----	-----	-----

½ mile south of; Furnace No. 2 mine, Upper Freeport bed (face of line heading, 6 butt entry, main haulageway).	81,471	B	1	2.0	28.8	54.7	14.5	2.5					1.2	7,078	12,740	2,510		175
Same (face of 6 left entry, 6 butt entry).	81,472	B	1	1.9	29.8	55.1	13.2	2.4					1.1	7,178	12,920	2,560		
Same (face of 4 left flat parallel entry).	81,473	B	1	2.3	30.1	56.0	11.6	2.9					1.4	7,261	13,070	2,200		
Same (composite of samples 81,471 to 81,473 inclusive).	81,474	B	1	2.1	31.0	53.9	13.0	2.5	4.9	71.8	1.4	6.4	1.3	7,194	12,950			
			2		31.6	55.1	13.3	2.5	4.8	73.4	1.4	4.6		7,344	13,220			
			3		36.5	63.5		2.9	5.6	84.6	1.6	5.3		8,478	15,260			
1 mile east of; Coffman mine, Upper Freeport bed (face of main heading).	81,494	B	1	2.8	29.9	60.8	6.5	3.5					2.0	7,733	13,920	2,180		176
			2		30.8	62.5	6.7	3.6						7,955	14,320			
Same Lower Kittanning bed (room near end of main entry).	81,495	B	1	2.3	30.0	57.6	10.1	4.3					1.7	7,411	13,340	2,0[illegible]0		
			2		30.7	58.9	10.4	4.4						7,589	13,660			
1 mile west of; Hairre mine, Waynesburg bed (face of main heading, 150 yds. from mine mouth).	81,336	B	1	3.2	29.8	45.6	21.4	3.1					1.7	6,278	11,300	2,280		176
Same (face of room, main heading, 100 yds from mine mouth).	81,337	B	1	3.5	28.9	44.4	23.2	3.2					2.0	6,072	10,930	2,280		
Same (composite of samples 81,336 and 81,337).	81,338	B	1	3.2	29.6	44.6	22.6	3.2	4.6	61.4	1.3	6.9	1.9	6,183	11,130			
			2		30.6	46.0	23.4	3.3	4.4	63.5	1.3	4.1		6,389	11,500			
			3		40.0	60.0		4.3	5.8	82.8	1.7	5.4		8,339	15,010			
East Millsboro; Hustead mine, Pittsburgh bed (face of 5 butt entry, 900 feet from slope bottom).	1,968	A	1	4.1	32.4	54.0	9.5	1.6					2.9	7,372	13,270		22	
Same (face of 1 butt entry, 1,300 feet north of slope bottom).	1,970	A	1	2.8	33.9	54.7	8.6	2.0					1.5				22	
Same (face of 2 room, 2 butt, 2 right flat entry, main entry, 3,600 feet southeast of mine mouth).	23,093	A	1	2.5	36.1	53.3	8.1	1.9					1.2	7.617	13,710	2,220	123	
Same (face of crosscut, 2 right entry, between 1 and 2 butts, 3,500 feet southeast of mine mouth)	23,091	A	1	2.5	36.0	53.5	8.0	1.8					1.2	7,633	13,740	2,110	123	
Same (face of 3 flat entry, 5,800 feet northeast of mine mouth).	23,095	A	1	2.7	34.9	54.1	8.3	1.7					1.3	7,567	13,620	2,380	123	
Same (face of 4 left flat parallel, 6,000 feet northeast of mine mouth).	23,096	A	1	2.4	35.4	53.8	8.4	1.6					1.1	7,600	13,680	2,440	123	
Same (composite of samples 23,093 to 23,096 inclusive).	23,097	A	1	2.5	35.7	53.6	8.2	1.8	5.2	76.2	1.5	7.1	1.2	7,583	13,650		123	
			2		36.6	55.0	8.4	1.8	5.0	78.1	1.5	5.2		7,878	14,000			
			3		40.0	60.0		2.0	5.5	85.3	1.7	5.5		8,494	15,290			
Fairchance; Deyarmon mine, Sewickley bed (face of 1 room, 10 butt).	81,564	B	1	2.6	33.6	51.8	12.0	4.0					1.6	7,222	13,000	2,280		176
Same (face of 1 room, 11 butt).	81,565	B	1	1.9	33.7	51.2	13.2	3.9					1.1	7,123	12,820	2,570		
Same (face of main dip entry).	81,566	B	1	1.5	34.9	52.9	10.7	3.5					.8	7,422	13,360	2,510		
Same (composite of samples 81,564 to 81,566 inclusive).	81,567	B	1	1.8	34.4	51.9	11.9	3.8	5.1	71.7	1.4	6.1	1.2	7,261	13,070			
			2		35.1	52.7	12.2	3.8	5.0	73.0	1.4	4.6		7,394	13,310			
			3		39.9	60.1		4.4	5.7	83.1	1.6	5.2		8,417	15,150			
1 mile west of; Swaney mine, Sewickley bed (face of 1 left flat entry, main entry).	84,772	B	1	2.5	32.7	54.8	10.0	2.4					2.1	7,403	13,320	2,280		177
Same (right rib of main heading, 750 feet from mine mouth).	84,773	B	1	2.8	32.8	53.8	10.6	3.3					2.5	7,304	13,150	2,280		
Same (composite of samples 84,772 and 84,773).	84,774	B	1	2.6	32.8	54.4	10.2	2.7	5.1	73.1	1.6	7.3	2.3	7,330	13,210			
			2		33.7	55.8	10.5	2.7	5.0	75.1	1.6	5.1		7,538	13,570			
			3		37.6	62.4		3.0	5.5	83.9	1.8	5.8		8,421	15,160			
1½ miles southwest of; Martin custom bank, Pittsburgh bed (left rib, main entry, 300 ft. from mine mouth)	84,840	B	1	4.6	30.6	57.1	7.7	1.3					4.0	7,464	13,430	2,800		177

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bul. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FAYETTE COUNTY—Continued.																		
Same (left rib, main entry, 75 ft. from mine mouth)	84,841	B	1	4.4	30.4	58.9	6.3	.7					3.9	7,614	13,710	2,910		
Same (composite of samples 84,840 and 84,841).	84,842	B	1	4.5	30.4	58.2	6.9	1.0	5.3	75.8	1.6	9.4	4.0	7,516	13,530			
			2		31.8	61.0	7.2	1.1	5.0	79.3	1.7	5.7		7,860	14,150			
			3		34.3	65.7		1.2	5.4	85.6	1.8	6.0		8,482	15,270			
Ferguson, ¾ mile from; United Refractories mine, Lower Kittanning bed (on rib, main entry, 500 yds. from mine mouth).	81,496	B	1	2.2	30.9	59.0	7.9	1.8					1.4	7,650	13,770	2,370		178
			2		31.6	60.3	8.1	1.9						7,822	14,080			
Gates; Gates No. 1 mine, Pittsburgh bed (face of crosscut, 12 room, 19 butt).	84,194	A	1	2.2	33.1	59.1	5.6	.8					1.8	7,798	14,040	2,600		178
Same (face of 10 left entry).	84,195	A	1	1.6	33.6	57.5	7.3	.8					1.2	7,693	13,850	2,620		
Same (face of 7 room, first section, A left).	84,196	A	1	1.9	33.2	58.8	6.1	1.0					1.4	7,707	13,870	2,570		
Same (composite of samples 84,194 to 84,196 inclusive).	84,197	A	1	1.9	33.5	58.2	6.4	.9	5.2	78.1	1.7	7.7	1.4	7,769	13,990			
			2		34.1	59.4	6.5	.9	5.1	79.6	1.7	6.2		7,919	14,250			
			3		36.5	63.5		.9	5.5	85.2	1.8	6.6		8,470	15,250			
½ mile east of; Hartley mine, Waynesburg bed (left rib, main heading, 1,000 feet from mine mouth).	84,256	B	1	3.5	32.3	52.3	11.9	1.3					2.7	6 985	12,570	2,620		179
Same (right rib, 3 left entry, 75 ft. from main entry)	84,257	B	1	4.2	31.8	50.0	14.0	1.4					3.4	6,650	12,140	2,570		
Same (right rib, 1 left entry, 100 feet from main entry).	84,258	B	1	3.3	32.1	51.2	13.4	1.0					2.5	6,897	12,420	2,680		
Same (composite of samples 84,256 to 84,258 inclusive.	84,259	B	1	3.7	31.9	51.2	13.2	1.3	5.0	69.3	1.6	9.6	2.9	6,881	12,390			
			2		33.1	53.2	13.7	1.3	4.7	72.0	1.7	6.6		7,142	12,850			
			3		38.4	61.6		1.6	5.4	83.4	2.0	7.6		8,279	14,900			
Hopewood, 1 mile west of; Meadowbrook mine Sewickley bed (face of 8 room, 1 butt, 3 left flat entry)	84,885	B	1	3.1	33.9	52.8	10.2	2.7					2.6	7,356	13,240	2,280		179
Same (face of room-neck, left rib, main dip entry, 100 feet from face of main dip entry).	84,886	B	1	2.9	33.7	53.3	10.1	2.9					2.4	7,356	13,240	2,240		
Same (face of main diagonal entry).	84,887	B	1	2.4	33.6	52.1	11.9	3.2					2.0	7,256	13,060	2,250		
Same (composite of samples 84,885 to 84,887 inclusive.	84,888	B	1	2.8	33.7	52.8	10.7	2.9	5.2	73.0	1.5	6.7	2.3	7,322	13,180			
			2		34.7	54.2	11.1	3.0	5.0	75.1	1.5	4.3		7 539	13,570			
			3		39.0	61.0		3.3	5.6	84.5	1.7	4.9		8,472	15,250			

Indian Head, ½ mile west of; Kuhn No. 2 mine, Lower Kittanning bed (face of 2 left entry).	81,467	B	1	3.1	22.4	67.2	7.3	2.0	-----	-----	-----	-----	2.1	7,767	13,980	2,340	-----	180
Same right rib of main heading, 20 feet from face)	81,468	B	1	2.7	22.8	66.1	8.4	2.9	-----	-----	-----	-----	1.9	7,683	13,830	2,110	-----	-----
Same (face of 2 right entry)	81,469	B	1	2.6	22.7	67.6	7.1	2.1	-----	-----	-----	-----	1.8	7,828	14,090	2,310	-----	-----
Same (composite of samples 81,467 to 81,469 inclusive).	81,470	B	1	2.7	22.7	67.2	7.4	2.3	4.8	78.9	1.4	5.2	1.9	7,772	13,990	-----	-----	-----
			2	-----	23.3	69.1	7.6	2.3	4.6	81.1	1.4	3.0	-----	7,983	14,370	-----	-----	-----
			3	-----	25.3	74.7	-----	2.5	5.0	87.8	1.5	3.2	-----	8,644	15,560	-----	-----	-----
Layton, 1 mile north of; Jacobs Creek Oil Co. mine, Upper Freeport bed (left rib, main entry, 200 feet from mine mouth).	85,325	B	1	2.3	33.6	57.3	6.8	2.3	-----	-----	-----	-----	1.8	7,700	13,860	2,130	-----	180
Same (face of main entry, 300 feet from mine mouth).	85,326	B	1	2.2	34.1	57.1	6.6	2.1	-----	-----	-----	-----	1.6	7,750	13,950	2,130	-----	-----
Same (composite of samples 85,325 and 85,326)	85,327	B	1	2.3	33.9	57.0	6.8	2.2	5.3	77.4	1.5	6.8	1.7	7,722	13,900	-----	-----	-----
			2	-----	34.7	58.4	6.9	2.2	5.2	79.2	1.5	5.0	-----	7,905	14,230	-----	-----	-----
			3	-----	37.3	62.7	-----	2.4	5.5	85.1	1.6	5.4	-----	8,483	15,270	-----	-----	-----
Leisenring; Leisenring No. 1 mine, Pittsburgh bed (line heading, 11 flat right entry, 2¾ miles from shaft bottom).	80,623	B	1	2.4	31.9	55.1	10.6	1.0	5.1	74.8	1.6	6.9	1.6	7,405	13,330	2,910	-----	181
			2	-----	32.7	56.5	10.8	1.0	4.9	76.6	1.7	5.0	-----	7,589	13,660	-----	-----	-----
			3	-----	36.6	63.4	-----	1.1	5.5	86.0	1.9	5.5	-----	8,511	15,320	-----	-----	-----
Lemont Furnace; Goddis mine, Sewickley bed (face of 1 left flat entry).	81,497	B	1	1.9	32.9	53.5	11.7	3.5	-----	-----	-----	-----	1.2	7,306	13,150	2,420	-----	181
Same (face of airway, main dip entry)	81,498	B	1	1.7	32.4	53.5	12.4	3.6	-----	-----	-----	-----	1.1	7,194	12,950	2,450	-----	-----
Same (face of 1 right flat entry)	81,499	B	1	2.0	33.0	53.4	11.6	3.1	-----	-----	-----	-----	1.1	7,289	13,120	2,110	-----	-----
Same (composite of samples 81,497 to 81,499 inclusive).	81,500	B	1	1.8	32.7	53.7	11.8	3.3	5.0	72.2	1.5	6.2	1.2	7,261	13,070	-----	-----	-----
			2	-----	37.8	62.2	-----	3.9	5.5	83.6	1.7	5.3	-----	8,411	15,140	-----	-----	-----
			3	-----	33.3	54.7	12.0	3.4	5.0	73.5	1.5	4.6	-----	7,400	13,320	-----	-----	-----
Masontown, ½ mile south of; Country bank, Redstone bed (right rib, main entry, 75 feet from mine mouth).	84,154	B	1	3.2	33.8	55.1	7.9	2.6	-----	-----	-----	-----	2.9	7,443	13,400	2,220	-----	181
			2	-----	34.9	56.9	8.2	2.7	-----	-----	-----	-----	-----	7,692	13,850	-----	-----	-----
¾ mile south of; Ross mine, Sewickley bed (face of main heading, 600 feet from mine mouth).	84,150	B	1	2.6	33.1	49.8	14.5	2.0	-----	-----	-----	-----	2.4	6,975	12,560	2,240	-----	182
Same (face of 3 right heading)	84,151	B	1	2.6	34.9	49.1	13.4	2.5	-----	-----	-----	-----	2.4	7,072	12,730	2,210	-----	-----
Same (right rib, main heading, 200 feet from mine mouth).	84,152	B	1	7.3	32.7	47.4	12.6	2.1	-----	-----	-----	-----	7.1	6,725	12,110	2,220	-----	-----
Same (composite of samples 84,150 to 84,152 inclusive).	84,153	B	1	4.1	33.3	49.1	13.5	2.2	5.1	68.1	1.4	9.7	4.0	6,942	12,500	-----	-----	-----
			2	-----	34.7	51.2	14.1	2.3	4.8	71.1	1.5	6.2	-----	7,242	13,040	-----	-----	-----
			3	-----	40.4	59.6	-----	2.6	5.6	82.7	1.7	7.4	-----	8,429	15,180	-----	-----	-----
1 mile northwest of; Griffith No. 1 mine, Pittsburgh bed (rib, main left entry).	81,558	B	1	2.6	32.9	55.8	8.7	1.2	-----	-----	-----	-----	1.2	7,528	13,550	2,910	-----	182
Same (face of main right entry)	81,559	B	1	2.5	34.2	56.0	7.3	.9	-----	-----	-----	-----	1.2	7,661	13,790	2,060	-----	-----
Same (composite of samples 81,558 and 81,559)	81,560	B	1	2.5	33.4	56.1	8.0	1.0	5.2	76.3	1.6	7.9	1.2	7,589	13,660	-----	-----	-----
			2	-----	34.2	57.6	8.2	1.0	5.1	78.2	1.6	5.9	-----	7,783	14,010	-----	-----	-----
			3	-----	37.2	62.8	-----	1.1	5.5	85.1	1.8	6.5	-----	8,472	15,250	-----	-----	-----
1 mile southeast of; Patrick No. 1 mine, Sewickley bed (face of 8 room, 3 left butt, 1 right flat entry	84,415	B	1	2.6	34.9	53.3	9.2	3.0	-----	-----	-----	-----	2.3	7,372	13,270	2,210	-----	183
Same (face of 1 flat right entry)	84,416	B	1	2.6	35.3	49.4	12.7	4.0	-----	-----	-----	-----	2.3	7,033	12,660	2,220	-----	-----
Same (face of 2 flat right entry)	84,417	B	1	2.9	35.8	51.4	9.9	3.7	-----	-----	-----	-----	2.5	7,300	13,140	2,200	-----	-----
Same (composite of samples 84,415 to 84,417 inclusive).	84,418	B	1	3.1	35.1	51.3	10.5	3.5	5.1	71.5	1.5	7.9	2.7	7,222	13,000	-----	-----	-----
			2	-----	36.2	53.0	10.8	3.6	4.9	73.7	1.5	5.5	-----	7,450	13,410	-----	-----	-----
			3	-----	40.6	59.4	-----	4.0	5.5	82.7	1.7	6.1	-----	8,350	15,030	-----	-----	-----
1 mile east of; Patrick No. 2 mine, Sewickley bed (face of 17 room, 1 left flat entry).	81,555	B	1	2.2	35.9	49.9	12.0	4.0	-----	-----	-----	-----	.9	7,189	12,940	2,090	-----	183
Same (face of 12 room, 2 butt heading)	81,556	B	1	2.7	34.8	50.7	11.8	4.1	-----	-----	-----	-----	1.4	7,161	12,890	2,510	-----	-----
Same (composite of samples, 81,555 and 81,556)	81,557	B	1	3.4	35.1	49.7	11.8	4.0	5.2	70.6	1.4	7.0	2.3	7,094	12,770	-----	-----	-----
			2	-----	36.3	51.5	12.2	4.1	5.0	73.1	1.5	4.1	-----	7,344	13,220	-----	-----	-----
			3	-----	41.4	58.6	-----	4.7	5.7	83.3	1.7	4.6	-----	8,361	15,050	-----	-----	-----

*, †, ‡, §, ¶. See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ultimate. Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FAYETTE COUNTY—Continued.																		
Mill Run, ½ mile west of; Penny mine, Lower Kittanning bed (face of room, main entry, 100 yds. from mine mouth).	81,345	B	1	1.9	27.7	53.2	17.2	3.1	-----	-----	-----	-----	1.3	6,867	12,360	2,200	-----	183
Same (face of room, main entry, 75 yds. from mine mouth).	81,346	B	1	2.5	27.5	54.6	15.4	3.5	-----	-----	-----	-----	1.7	6,983	12,570	2,200	-----	-----
Same (composite of samples, 81,345 and 81,346)	81,347	B	1	2.2	26.9	54.8	16.1	3.3	4.8	69.2	1.2	5.4	1.5	6,933	12,480	-----	-----	-----
			2	-----	27.5	56.0	16.5	3.4	4.6	70.7	1.3	3.5	-----	7,083	12,750	-----	-----	-----
			3	-----	32.9	67.1	-----	4.1	5.5	84.6	1.5	4.3	-----	8,483	15,270	-----	-----	-----
Mount Braddock; Ainsley mine, Pittsburgh bed (rib in main entry).	81,614	B	1	1.5	33.7	56.7	8.1	.9	-----	-----	-----	-----	.8	7,656	13,780	2,850	-----	184
Same (split in old pillar)	81,615	B	1	1.6	32.0	58.3	8.1	1.0	-----	-----	-----	-----	.8	7,672	13,810	2,910	-----	-----
Same (composite of samples 81,614 and 81,615)	81,616	B	1	1.6	32.5	57.8	8.1	1.1	5.3	77.3	1.6	6.6	.8	7,694	13,850	-----	-----	-----
			2	-----	33.0	58.8	8.2	1.1	5.2	78.5	1.6	5.4	-----	7,817	14,070	-----	-----	-----
			3	-----	36.0	64.0	-----	1.2	5.6	85.6	1.7	5.9	-----	8,517	15,330	-----	-----	-----
New Geneva, ½ mile north of; Stevenson mine, Sewickley bed (face of 3 room, 2 left entry).	84,318	B	1	2.3	35.0	52.4	10.3	3.3	-----	-----	-----	-----	1.9	7,328	13,190	2,240	-----	184
Same (face of main heading, 1,500 feet from mine mouth).	84,319	B	1	2.0	36.3	52.7	9.0	3.1	-----	-----	-----	-----	1.6	7,439	13,390	2,240	-----	-----
Same (face of 2 room, 2 right entry)	84,320	B	1	2.2	36.0	51.5	10.3	3.6	-----	-----	-----	-----	2.0	7,294	13,130	2,240	-----	-----
Same (composite of samples 84,318 to 84,320 inclusive).	84,321	B	1	2.1	36.0	52.1	9.8	3.2	5.1	73.0	1.4	7.5	1.9	7,344	13,220	-----	-----	-----
			2	-----	36.7	53.2	10.1	3.3	5.0	74.6	1.4	5.6	-----	7,500	13,500	-----	-----	-----
			3	-----	40.8	59.2	-----	3.7	5.6	82.9	1.6	6.2	-----	8,339	15,010	-----	-----	-----
2 miles southeast of; Hoffman mine, Sewickley bed (face of main parallel, 250 feet from mine mouth)	84,625	B	1	3.0	35.1	50.8	11.1	2.7	-----	-----	-----	-----	2.4	7,217	12,990	2,240	-----	185
Same (face of 1 room, right entry)	84,626	B	1	3.1	35.5	51.9	9.5	2.7	-----	-----	-----	-----	2.7	7,306	13,150	2,240	-----	-----
Same (face of main heading)	84,627	B	1	2.6	35.2	53.2	9.0	2.4	-----	-----	-----	-----	2.3	7,367	13,260	2,280	-----	-----
Same (composite of samples 84,625 to 84,627 inclusive).	84,628	B	1	3.0	35.1	52.0	9.9	2.7	5.3	72.5	1.5	8.1	2.5	7,308	13,160	-----	-----	-----
			2	-----	36.2	53.6	10.2	2.7	5.1	74.8	1.5	5.7	-----	7,535	13,560	-----	-----	-----
			3	-----	40.3	59.7	-----	3.1	5.7	83.3	1.7	6.2	-----	8,391	15,100	-----	-----	-----

2½ miles southeast of Atlantic No. 1 mine, Pittsburgh bed (face of 3 left butt heading).	84,653	B	1	4.6	34.6	53.9	6.9	.3					4.0	7,460	13,430	2,220		185
Same (face of main heading),	84,654	B	1	4.0	34.6	54.5	6.9	2.5					3.5	7,473	13,450	2,220		
Same (right rib of 2 room, 100 feet from 3 right butt heading).	84,655	B	1	3.3	36.0	54.8	5.9	2.1					2.9	7,615	13,710	2,110		
Same (face of 1 right butt parallel heading),	84,656	B	1	3.3	35.2	54.7	6.8	2.4					3.0	7,534	13,560	2,110		
Same (composite of samples 84,653 to 84,656 inclusive).	84,657	B	1	3.7	34.9	54.8	6.6	2.4	5.4	75.2	1.5	8.9	3.4	7,566	13,620			
			2		36.2	56.9	6.9	2.4	5.2	78.1	1.6	5.8		7,858	14,140			
			3		38.9	61.1		2.6	5.6	83.9	1.7	6.2		8,438	15,190			
Ohiopyle; Bailey mine, Upper Kittanning bed (face of right entry, 2 left entry).	81,487	B	1	2.5	22.8	57.6	17.1	2.1					1.6	6,839	12,310	2,560		185
Same (rib of right entry 2 left entry),	81,488	B	1	2.6	24.4	59.8	13.2	2.5					1.8	7,161	12,890	2,450		
Same (composite of samples 81,487 and 81,488),	81,489	B	1	2.6	23.8	58.6	15.0	2.4	4.6	71.0	1.2	5.8	1.7	6,994	12,590			
			2		24.4	60.2	15.4	2.4	4.5	72.9	1.2	3.7		7,178	12,920			
			3		28.9	71.1		2.9	5.3	86.2	1.4	4.3		8,484	15,270			
1 mile west of; Jim Run mine, Lower Kittanning bed (face of room, 3 right entry).	81,484	B	1	3.2	23.8	60.3	12.7	4.2					2.3	7,211	12,980	2,220		186
Same,	81,485	B	1	3.0	23.4	62.6	11.0	4.1					2.0	7,428	13,370	2,110		
Same (composite of samples 81,484 and 81,485),	81,486	B	1	3.0	24.2	61.1	11.7	4.0	4.7	73.0	.9	5.7	2.2	7,306	13,150			
			2		24.9	63.0	12.1	4.1	4.5	75.3	1.0	3.0		7,533	13,560			
			3		28.3	71.7		4.7	5.1	85.6	1.1	3.5		8,567	15,420			
3 miles north of; Stull mine, Brookville bed left rib, 5 feet from face of main heading).	81,357	B	1	3.5	25.3	62.2	9.0	.9					3.1	7,550	13,590	2,340		186
Same (face of 2 right entry, main entry),	81,358	B	1	3.3	24.5	59.7	12.5	1.0					3.0	7,222	13,000	2,310		
Same (composite of samples 81,357 and 81,358),	81,359	B	1	3.4	25.1	60.8	10.7	1.1	4.9	73.8	1.1	8.4	3.1	7,400	13,320			
			2		25.9	63.0	11.1	1.1	4.7	76.3	1.1	5.7		7,661	13,790			
			3		29.2	70.8		1.2	5.3	85.8	1.3	6.4		8,611	15,500			
Same, Lower Freeport bed (right rib, 5 feet from face of main heading, 80 feet from mine mouth).	81,356	B	1	3.3	28.9	61.4	6.4	2.9					2.6	7,733	13,920	2,240		187
			2		29.8	63.6	6.6	3.0						7,994	14,390			
3 miles southwest of; Torrence mine, Upper Kittanning bed (left rib, 1 room, 2 butt heading, 1 left entry).	81,360	B	1	2.8	25.7	65.4	6.1	1.8					2.3	7,850	14,130	2,420		187
Same (left rib, main loading heading, 200 feet beyond 1 left entry).	81,361	B	1	3.2	26.2	63.5	7.1	2.0					2.7	7,700	13,860	2,450		
Same (composite of samples 81,360 and 81,361),	81,362	B	1	3.1	25.9	64.2	6.8	1.9	5.2	78.6	1.4	6.1	2.5	7,772	13,990			
			2		26.7	66.2	7.1	2.0	5.0	81.1	1.5	3.3		8,022	14,440			
			3		28.7	71.3		2.1	5.3	87.3	1.6	3.8		8,633	15,540			
Oliphant Furnace; Oliphant mine, Pittsburgh bed (face of 1 room, 15 south flat entry).	84,880	B	1	2.8	31.0	59.7	6.5	.9					2.3	7,689	13,840	2,960		187
Same (face of 2 butt heading, 14 north flat entry),	84,881	B	1	3.0	30.8	60.2	6.0	1.2					2.5	7,699	13,860	2,510		
Same (face of 1 rib, 2 butt heading, 12 south face heading).	84,882	B	1	2.7	31.8	59.6	5.9	1.0					2.2	7,759	13,970	2,680		
Same (face of 4 butt heading, 11 south flat entry),	84,883	B	1	3.0	30.1	60.6	6.3	1.0					2.5	7,682	13,830	2,620		
Same (composite of samples 84,880 to 84,883 inclusive).	84,884	B	1	2.9	30.9	60.0	6.2	1.0	5.3	77.7	1.7	8.1	2.4	7,717	13,890			
			2		31.9	61.7	6.4	1.0	5.1	80.0	1.8	5.7		7,944	14,300			
			3		34.0	66.0		1.1	5.5	85.5	1.9	6.0		8,489	15,280			
1 mile west of; Jeffrey No. 1 mine, Sewickley bed (face of 5 room, 2 butt heading, 2 flat entry).	84,843	B	1	3.4	33.5	52.2	10.9	3.1					2.9	7,242	13,030	2,280		188
Same (face of 1 room, 7 butt heading, straight flat entry).	84,844	B	1	4.2	33.6	52.4	9.8	2.6					3.7	7,281	13,110	2,280		
Same (face of 3 butt heading, 2 flat heading),	84,845	B	1	3.7	34.1	52.8	9.4	2.7					3.2	7,365	13,260	2,310		

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FAYETTE COUNTY—Contined																		
Same (composite of samples 84,843 to 84,845 inclusive).	84,846	B	1	3.8	34.1	52.0	10.1	2.7	5.3	72.5	1.6	7.8	3.3	7,322	13,180			
			2		35.4	54.1	10.5	2.8	5.0	75.3	1.6	4.8		7,606	13,690			
			3		39.6	60.4		3.1	5.6	84.2	1.8	5.3		8,500	15,300			
Point Marion, 1 mile southeast of; Frederick No. 1 mine, Pittsburgh bed (face of 21 room, 4 left butt, main heading).	84,593	B	1	2.7	35.5	55.6	6.2	1.8					2.2	7,704	13,870	2,450		188
Same (face of West Virginia heading),	84,594	B	1	2.2	34.7	55.1	8.0	2.2					1.7	7,577	13,640	2,390		
Same (face of 1 left butt heading, West Virginia heading).	84,595	B	1	2.3	35.6	54.6	7.5	2.4					1.8	7,672	13,810	2,310		
Same (composite of samples 84,593 to 84,595 inclusive).	84,596	B	1	2.4	35.7	54.8	7.1	2.0	5.3	76.8	1.6	7.2	1.9	7,674	13,810			
			2		36.6	56.1	7.3	2.1	5.1	78.7	1.6	5.2		7,866	14,160			
			3		39.4	60.6		2.3	5.6	84.9	1.8	5.4		8,483	15,270			
2 miles north of; Winstead mine, Pittsburgh bed (left rib, 3 right heading, 700 feet from main heading)	84,529	B	1	4.0	34.6	54.8	6.6	2.0					3.4	7,561	13,610	2,280		189
Same (face of left rib, main heading, 1,000 feet from mine mouth).	84,530	B	1	3.2	34.8	54.9	7.1	2.1					2.6	7,555	13,600	2,200		
Same (right rib, 1 right heading, 500 feet from main heading).	84,531	B	1	3.5	34.5	55.9	6.1	1.6					2.9	7,654	13,780	2,340		
Same (composite of samples 84,529 to 84,531 inclusive).	84,532	B	1	3.6	34.4	55.5	6.5	1.9	5.5	75.8	1.6	8.7	3.0	7,576	13,640			
			2		35.7	57.6	6.7	2.0	5.3	78.6	1.6	5.8		7,856	14,140			
			3		38.3	61.7		2.1	5.7	84.3	1.8	6.1		8,424	15,160			
Revere (Uledi P. O.); Beal mine, Pittsburgh bed (face of 8 room, main dip entry).	84,893	B	1	3.5	32.4	58.3	5.8	.8					2.5	7,689	13,840	2,910		189
Same (left rib of 2 room, 25 ft. from main dip entry)	84,894	B	1	3.4	32.7	57.3	6.6	.9					2.5	7,611	13,700	2,910		
Same (composite of samples 84,893 and 84,894)	84,895	B	1	3.5	32.1	58.2	6.2	.8	5.3	77.4	1.7	8.6	2.5	7,672	13,810			
			2		33.2	60.3	6.5	.8	5.1	80.1	1.7	5.8		7,944	14,300			
			3		35.5	64.5		.9	5.4	85.7	1.8	6.2		8,494	15,290			
¼ mile east of; Playford mine, Sewickley bed (face of 7 room entry, 2 left entry).	84,889	B	1	1.8	35.3	53.5	9.4	3.2					1.1	7,461	13,430	2,110		190
Same (left rib, 2 right entry, 3 right parallel entry)	84,890	B	1	2.2	35.0	53.7	9.1	2.8					1.5	7,486	13,470	2,190		
Same (face of 1 room, 2 right entry),	84,891	B	1	2.5	34.0	52.6	10.9	2.9					1.8	7,281	13,110	2,180		

Same (composite of samples 84,889 to 84,891 inclusive)	84,892	B	1	..2	34.1	53.9	9.8	3.0	5.1	73.7	1.3	7.1	1.5	7,408	13,330	-------	-----	-----
			2	----	34.8	55.2	10.0	3.0	5.0	75.4	1.3	5.3	-----	7,571	13,6[illegible]0	-----	-----	-----
			3	----	38.7	61.3	------	3.4	5.6	83.7	1.4	5.9	-----	8,413	15,14	------	-----	-----
Same (face of 2 room, 2 left entry),	81,552	B	1	1.5	34.8	52.0	11.7	3.3	-----	------	-----	-----	.6	7,289	13,[illegible]	2,510	-----	1[illegible]0
Same (face of room, 3 left entry),	81,553	B	1	1.5	34.5	51.5	12.7	3.3	-----	------	-----	-----	.7	7,2[illegible]	1[illegible]80	2,2[illegible]0	-----	-----
Same (composite of samples 81,552 and 81,553)	81,554	B	1	1.6	34.5	51.8	12.1	3.3	5.0	71.8	1.4	6.4	.7	7,261	13,070	-------	-----	-----
			2	----	35.1	52.6	12.3	3.3	4.9	72.9	1.4	5.2	-----	7,[illegible]7	13,7[illegible]	-------	-----	-----
			3	----	40.0	60.0	------	3.8	5.6	83.1	1.6	5.9	-----	8,106	15,1[illegible]0	-------	-----	-----
Rodgers Mills; Rodgers No. 2 mine. Upper Kittanning bed (face of heading, left side of mine).	81,475	B	1	3.1	24.4	64.1	8.4	2.4	-----	------	-----	-----	1.9	7,644	13,700	2,250	-----	191
Same (face of heading, right side of mine),	81,476	B	1	2.5	24.0	64.5	9.0	2.1	-----	------	-----	-----	1.8	7,639	13,750	2,3[illegible]0	-----	-----
Same (composite of samples 81,475 and 81,476)	81,477	B	1	2.7	24.2	64.3	8.8	2.3	4.7	77.8	1.4	5.0	1.8	7,644	13,760	-------	-----	-----
			2	----	24.8	66.1	9.1	2.3	4.6	80.0	1.4	2.6	-----	7,861	14,150	-------	-----	-----
			3	----	27.3	72.7	------	2.5	5.0	87.9	1.5	3.1	-----	8,641	15,560	-------	-----	-----
¼ mile east of; Rose mine, Lower Kittanning (?) bed (face of main entry, 200 feet from mine mouth)	81,481	B	1	3.4	18.0	54.7	23.9	5.2	-----	------	-----	-----	2.1	6,067	10,920	2,7[illegible]0	-----	191
				2.9	20.3	57.5	19.3	5.9	-----	------	-----	-----	2.0	6,528	11,750	2,[illegible]00	-----	-----
Same (rib of main entry, 175 ft. from mine mouth)	81,482	B	1															
Same (composite of samples 81,481 and 81,482)	81,483	B	1	3.3	19.0	56.1	21.6	5.6	4.1	62.9	1.1	4.7	2.0	6,305	11,350	-------	-----	-----
			2	----	19.6	58.1	22.3	5.7	3.9	65.0	1.2	1.9	-----	6,517	11,730	-------	-----	-----
			3	----	25.2	74.8	------	7.4	5.0	83.6	1.5	2.5	-----	8,389	15,100	-------	-----	-----
2⅔ miles south of; Grimes mine Lower Freeport bed (face of 1 heading, 2 left entry).	81,478	B	1	2.3	25.3	61.3	11.1	3.5	-----	------	-----	-----	1.4	7,444	13,400	2,150	-----	192
Same (rib, 1 right entry, main heading),	81,479	B	1	3.2	24.0	63.3	9.5	2.4	-----	------	-----	-----	2.0	7,422	13,360	2,090	-----	-----
Same (composite of samples 81,478 and 81,479)	81,480	B	1	2.8	24.6	62.3	10.3	2.9	4.8	74.6	1.4	6.0	1.7	7,428	13,370	-------	-----	-----
			2	----	25.2	64.2	10.6	3.0	4.6	76.7	1.4	3.7	-----	7,639	13,750	-------	-----	-----
			3	----	28.2	71.8	------	3.3	5.1	85.8	1.6	4.2	-----	8,544	15,380	-------	-----	-----
Sand Rock, ½ mile southeast of; Corrado No. 2 mine, Upper Kittanning bed (face of 1 left heading).	85,331	B	1	2.0	31.8	55.9	10.3	2.8	-----	------	-----	-----	1.8	7,422	13,360	2,180	-----	192
Same (face of 2 left heading),	85,332	B	1	1.8	32.3	57.5	8.4	2.6	-----	------	-----	-----	1.6	7,589	13,660	2,150	-----	-----
Same (face of main heading),	85,333	B	1	2.0	33.5	56.8	7.7	2.1	-----	------	-----	-----	1.8	7,672	13,810	2,180	-----	-----
Same (composite of samples 85,331 to 85,333 inclusive)	85,334	B	1	2.1	31.9	57.3	8.7	2.5	5.1	75.0	1.4	7.3	1.7	7,567	13,620	-------	-----	-----
			2	----	32.6	58.5	8.9	2.5	4.9	76.6	1.4	5.7	-----	7,728	13,910	-------	-----	-----
			3	----	35.8	64.2	------	2.8	5.4	84.1	1.6	6.1	-----	8,478	15,260	-------	-----	-----
Smithfield, 3⅓ miles west of; Baxter Ridge No. 2 mine, Pittsburgh bed (face of diagonal entry, 1 left butt heading).	84,643	B	1	3.2	32.7	53.5	10.6	2.6	-----	------	-----	-----	2.7	7,312	13,160	2,390	-----	192
Same (face of 2 right flat parallel entry),	84,644	B	1	4.5	32.4	54.4	8.7	1.7	-----	------	-----	-----	4.3	7,343	13,220	2,570	-----	-----
Same (face of 4 room, 1 right flat entry),	84,645	B	1	4.0	32.6	55.8	7.6	1.9	-----	------	-----	-----	3.7	7,481	13,470	2,450	-----	-----
Same (composite of samples 84,643 to 84,645 inclusive)	84,646	B	1	4.0	32.1	55.0	8.9	2.1	5.3	73.7	1.6	8.4	3.6	7,381	13,280	-------	-----	-----
			2	----	33.4	57.3	9.3	2.1	5.1	76.8	1.6	5.1	-----	7,684	13,830	-------	-----	-----
			3	----	36.8	63.2	------	2.4	5.6	84.6	1.8	5.6	-----	8,470	15,250	-------	-----	-----
4 miles north of; Sapper mine Sewickley bed (face of main dip heading, main dip section, 300 feet from mine mouth).	84,410	B	1	2.5	35.1	53.2	9.2	3.8	-----	------	-----	-----	2.0	7,456	13,420	2,280	-----	193
Same (face of main entry, 5 flat section, 300 feet from mine mouth).	84,411	B	1	2.6	36.3	53.3	7.8	3.2	-----	------	-----	-----	2.2	7,572	13,630	2,240	-----	
Same (right rib, main entry, 2 flat section 200 feet from mine mouth).	84,412	B	1	3.3	35.9	52.6	8.2	3.2	-----	------	-----	-----	2.9	7,513	13,520	2,310	-----	
Same (face of 3 room, 5 right parallel entry, 5 right flat section).	84,413	B	1	2.4	36.7	52.2	8.7	3.3	-----	------	-----	-----	2.0	7,499	13,500	2,340	-----	

*, †, ‡, §, ¶, See footnote Page 17

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Ultimate. Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FAYETTE COUNTY—Continued.																		
Same (composite of samples 84,410 to 84,413 inclusive)	84,414	B	1	2.6	35.7	53.2	8.5	3.3	5.2	74.6	1.5	6.9	2.3	7,506	13,510	-----	-----	-----
			2	-----	36.6	54.7	8.7	3.4	5.1	76.6	1.5	4.7	-----	7,711	13,880	-----	-----	-----
			3	-----	40.1	59.9	-----	3.7	5.6	83.9	1.7	5.1	-----	8,444	15,200	-----	-----	-----
Somerfield, 1/4 mile west of; Thomasdale mine, Upper Freeport bed (face of main heading).	81,353	B	1	2.4	24.5	56.1	17.0	3.4	-----	-----	-----	-----	1.9	6,883	12,390	2,270	-----	193
Same (left rib, 2 right entry, 5 feet from face)	81,354	B	1	2.0	24.8	56.8	16.4	3.5	-----	-----	-----	-----	1.6	6,972	12,550	2,280	-----	-----
Same (composite of samples 81,353 and 81,354)	81,355	B	1	2.1	24.9	56.6	16.4	3.4	4.6	69.7	1.2	4.7	1.8	6,933	12,480	-----	-----	-----
			2	-----	25.4	57.9	16.7	3.4	4.4	71.1	1.3	3.1	-----	7,078	12,740	-----	-----	-----
			3	-----	30.5	69.5	-----	4.1	5.3	85.4	1.5	3.7	-----	8,500	15,300	-----	-----	-----
Stewarton, 1/2 mile east of; Stewarton mine, Clarion bed (face of 3 heading, 3 butt entry).	81,342	B	1	2.6	25.1	58.5	13.8	5.1	-----	-----	-----	-----	1.6	7,100	12,780	2,370	-----	194
Same (on rib between 1 and 2 room, 2 butt entry)	81,343	B	1	2.2	24.3	60.4	13.1	4.4	-----	-----	-----	-----	1.1	7,183	12,930	2,200	-----	-----
Same (composite of samples 81,342 and 81,343)	81,344	B	1	2.5	24.1	59.9	13.6	5.0	4.7	71.4	1.2	4.1	1.4	7,139	12,850	-----	-----	-----
			2	-----	24.7	61.4	13.9	5.2	4.5	73.1	1.2	2.1	-----	7,311	13,160	-----	-----	-----
			3	-----	28.7	71.3	-----	6.0	5.2	84.9	1.4	2.5	-----	8,494	15,290	-----	-----	-----
Uniontown, 2 miles northeast of; Evans No. 3 mine, Sewickley bed (face of 12 right flat parallel entry)	85,318	B	1	1.8	32.0	56.0	10.2	2.8	-----	-----	-----	-----	1.5	7,467	13,440	2,240	-----	194
Same (face of main dip entry), -----	85,319	B	1	1.8	32.9	53.7	11.6	3.2	-----	-----	-----	-----	1.6	7,317	13,170	2,200	-----	-----
Same (face of 11 left flat parallel entry), -----	85,320	B	1	2.4	32.6	55.4	9.6	3.1	-----	-----	-----	-----	2.2	7,467	13,440	2,280	-----	-----
Samples (composite of samples 85,318 to 85,320 inc.)	85,321	B	1	2.0	32.6	54.8	10.6	3.0	5.0	73.7	1.5	6.2	1.8	7,394	13,310	-----	-----	-----
			2	-----	33.3	55.9	10.8	3.1	4.9	75.2	1.5	4.5	-----	7,544	13,580	-----	-----	-----
			3	-----	37.3	62.7	-----	3.5	5.5	84.3	1.7	5.0	-----	8,461	15,230	-----	-----	-----
3 miles east of; Springer mine, Upper Freeport bed (face of main parallel heading).	84,949	B	1	2.7	28.5	55.4	13.4	3.7	-----	-----	-----	-----	2.4	7,044	12,680	2,220	-----	195
Same (face of main heading), -----	84,950	B	1	2.7	27.4	55.3	14.6	3.9	-----	-----	-----	-----	2.4	6,911	12,440	2,110	-----	-----
Same (composite of samples of 84,949 and 84,950)	84,951	B	1	2.7	28.1	55.1	14.1	3.8	4.7	70.2	1.2	6.0	2.4	6,978	12,560	-----	-----	-----
			2	-----	28.9	56.6	14.5	3.9	4.5	72.2	1.3	3.6	-----	7,172	12,910	-----	-----	-----
			3	-----	33.8	66.2	-----	4.5	5.3	84.5	1.5	4.2	-----	8,394	15,110	-----	-----	-----
Waltersburg, 1/2 mile southeast of; Valley mine Gallitzin bed (face of 4 right butt entry, main entry)	84,988	B	1	1.9	36.1	54.5	7.5	3.0	-----	-----	-----	-----	1.6	7,678	13,820	1,890	-----	195
Same (face of 6 right butt entry, main entry)	84,989	B	1	1.6	34.5	54.0	9.9	3.8	-----	-----	-----	-----	1.3	7,489	13,480	1,890	-----	-----

Same (composite of samples 84,988 and 84,989)	84,990	B	1	1.7	35.5	54.1	8.7	3.4	5.2	75.1	1.2	6.4	1.4	7,606	13,690		
			2		36.1	55.1	8.8	3.5	5.1	76.4	1.2	5.0		7,733	13,920		
			3		39.6	60.4		3.8	5.6	83.7	1.4	5.5		8,483	15,270		
1 mile east of; Walter's mine, Hagers bed (rib of main entry).	81,583	B	1	2.2	35.6	54.2	8.0	3.2					1.3	7,638	13,750	2,140		195
Same (rib, 7 butt entry),	81,584	B	1	2.1	35.3	52.4	10.2	5.3					1.2	7,433	13,380	1,940		
Same (composite of samples 81,583 and 81,584)	81,585	B	1	2.2	35.0	53.6	9.2	4.2	5.2	74.5	1.3	5.6	1.2	7,528	13,550			
			2		35.8	54.8	9.4	4.3	5.1	76.2	1.4	3.6		7,694	13,850			
			3		39.5	60.5		4.7	5.6	84.1	1.5	4.1		8,494	15,280			
1 mile south of; Waltersburg mine, Pittsburgh bed (first monkey heading, robbing pillars).	81,561	B	1	2.2	32.4	56.0	8.4	1.1					1.1	7,556	13,600	2,910		196
Same (pillar in robbing work),	81,562	B	1	2.3	32.7	56.6	8.4	1.1					1.0	7,561	13,610	2,570		
Same (composite of samples 81,561 and 81,562)	81,563	B	1	2.3	32.9	56.4	8.4	1.1	5.1	75.7	1.5	8.2	1.0	7,439	13,570			
			2		33.7	57.7	8.6	1.1	5.0	77.5	1.6	6.2		7,711	13,880			
			3		36.8	63.2		1.2	5.4	84.7	1.7	7.0		8,439	15,190			
GREENE COUNTY																	
Besco; William Pitt mine, Pittsburgh bed (face of 1 left butt, 2 north entry).	83,976	B	1	2.5	35.0	55.8	6.7	1.1					1.7	7,607	13,690	2,240		196
Same (face of 1 north entry),	83,977	B	1	2.8	35.0	55.6	6.6	1.0					2.0	7,633	13,740	2,240		
Same (face of 2 right butt, 1 north entry),	83,978	B	1	2.5	34.8	55.6	7.1	1.3					1.7	7,575	13,630	2,280		
Same (right rib, main haulageway, 300 feet from mine mouth).	83,979	B	1	2.7	34.8	56.4	6.1	.8					1.9	7,663	13,790	2,620		
Same (composite of samples 83,976 to 83,979 inclusive).	83,980	B	1	2.6	34.9	55.8	6.7	1.2	5.3	77.0	1.6	8.2	1.8	7,621	13,720			
			2		35.8	57.3	6.9	1.2	5.1	79.1	1.6	6.1		7,824	14,090			
			3		38.5	61.5		1.3	5.5	85.0	1.7	6.5		8,404	15,130			
Clarksville, ½ mile west of; Edward mine, Pittsburgh bed (face of main rise).	83,846	B	1	3.0	33.3	55.7	8.0	1.3					2.1	7,479	13,460	2,310		197
Same (face of 1 right butt entry),	83,847	B	1	3.0	34.7	56.5	5.8	1.0					2.1	7,691	13,840	2,390		
Same (left rib, main air shaft entry, 200 feet from shaft).	83,848	B	1	3.6	33.0	55.0	8.4	1.5					2.6	7,397	13,320	2,310		
Same (composite of samples 83,846 to 83,848 inclusive).	83,849	B	1	3.1	33.7	55.8	7.4	1.3	5.2	76.0	1.6	8.5	2.2	7,503	13,510			
			2		34.8	57.6	7.6	1.3	5.1	78.4	1.7	5.9		7,743	13,940			
			3		37.7	62.3		1.4	5.5	84.8	1.8	6.5		8,380	15,090			
Crucible; Crucible mine, Pittsburgh bed (face of main heading).	84,169	B	1	2.6	34.5	55.7	7.2	2.1					1.8	7,580	13,640	2,220		197
Same (face of 1 west flat entry, 3 main right entry)	84,170	B	1	2.2	34.7	55.8	7.3	1.2					1.3	7,632	13,730	2,390		
Same (face of 1 east flat entry, 2 section, 2 main left entry).	84,171	B	1	1.9	35.9	55.5	6.7	1.0					1.1	7,717	13,890	2,620		
Same (face of 2 east flat entry, 2 section, 2 main left entry).	84,172	B	1	1.7	34.6	54.8	8.9	1.3					1.2	7,555	13,600	2,620		
Same (face of 3 east flat entry, 2 section, 2 main left entry).	84,173	B	1	2.6	34.7	53.6	9.1	1.9					1.8	7,412	13,340	2,390		
Same (face of 3 east flat entry, 1 section, 1 main left entry).	84,174	B	1	2.1	35.1	54.7	8.1	2.0					1.3	7,541	13,580	2,160		
Same (composite of samples 84,169 to 84,174 inclusive).	84,175	B	1	2.1	35.1	55.1	7.7	1.5	5.2	76.1	1.6	7.9	1.4	7,591	13,670			
			2		35.9	56.2	7.9	1.6	4.5	77.7	1.7	6.6		7,762	13,970			
			3		38.9	61.1		1.7	4.9	84.4	1.8	7.2		8,420	15,160			

*, †, ‡, §, ¶, See footnote Page 17

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
GREENE COUNTY—Continued.																		
Durbin; Crabapple mine, Waynesburg bed,	1,585	B	1	2.8	36.1	48.3	12.8	3.5					1.2				22	
			2		37.1	49.7	13.2	3.6										
Grays Landing, ½ mile south of; Alicia No. 2 mine, Pittsburgh bed (face of 21 right butt entry, 3 left entry).	84,203	B	1	1.9	34.2	53.1	10.8	2.5					1.5	7,365	13,260	2,240		198
Same (face of 12 face entry, 4 left entry),	84,204	B	1	2.1	35.4	55.5	7.0	2.0					1.6	7,611	13,700	2,200		
Same (left rib of 5 left entry, 400 feet from main entry).	84,205	B	1	1.7	34.0	56.1	8.2	2.7					1.3	7,557	13,600	2,200		
Same (right rib of 4 entry, 4,000 feet from main entry).	84,206	B	1	2.5	33.7	55.6	8.2	2.5					1.9	7,529	13,550	2,170		
Same (face of 5 room, 1 butt entry, 3 right entry)	84,207	B	1	1.9	34.4	56.7	7.0	2.0					1.5	7,650	13,790	2,510		
Same (composite of samples 84,203 to 84,207 inclusive).	84,208	B	1	2.0	34.6	55.1	8.3	2.4	5.2	75.8	1.6	6.7	1.6	7,575	13,640			
			2		35.3	56.3	8.4	2.4	5.0	77.4	1.6	5.2		7,733	13,920			
			3		38.6	61.4		2.6	5.5	84.5	1.7	5.7		8,446	15,200			
Drift mine (near Alicia No. 2 mine), Sewickley bed (left rib, 3 left entry, main entry, 1,300 feet from mine mouth).	84,246	B	1	2.2	34.3	51.8	11.7	3.0					1.9	7,148	12,860	2,230		198
Same (face of main heading),	84,247	B	1	2.4	35.1	52.6	9.9	2.9					2.2	7,259	13,070	2,280		
Same (composite of samples 84,246 and 84,247)	84,248	B	1	2.3	35.0	51.9	10.8	2.9	5.1	71.7	1.5	8.0	2.1	7,198	12,950			
			2		35.9	53.0	11.1	3.0	4.9	73.5	1.6	5.9		7,372	13,270			
			3		40.4	59.6		3.4	5.5	82.6	1.7	6.8		8,289	14,920			
Jefferson; Fulton country bank, Waynesburg bed (at face, 50 feet from mine mouth).	83,751	B	1	3.2	34.0	49.9	12.9	3.1					2.5	6,950	12,510			199
			2		35.1	51.6	13.3	3.2						7,178	12,920			
¾ mile north of; Rogers country bank, Waynesburg bed (at face, 300 feet from mine mouth, upper bench)	83,752	B	1	3.1	36.2	46.3	14.4	3.8					2.6	6,822	12,280			199
			2		37.3	47.9	14.8	3.9						7,038	12,670			
Same (lower bench),	83,753	B	1															
			2	3.9	34.4	50.0	11.7	3.0					3.2	7,011	12,620			
Mather; Mather No. 1 mine, Pittsburgh bed (face of 2 south face heading).	83,771	B	1		35.8	52.0	12.2	3.1						7,294	13,130			
				3.7	35.1	55.7	5.5	.8					2.9	7,617	13,710	2,450		199
Same (face of 5 south face heading),	83,772	B	1	2.5	35.6	55.8	6.1	1.0					1.7	7,673	13,810	2,340		

Same (face of 10 south face heading)*	83,773	B	1	3.0	35.1	55.9	6.0	1.0	----	----	----	----	2.2	7,639	13,750	2,280	----	----
Same (face of 3 main north butt heading),	83,774	B	1	2.3	36.2	57.3	4.2	.8	----	----	----	----	1.5	7,852	14,140	2,390	----	----
Same (face of 5 main north face heading),	83,775	B	1	3.5	34.6	55.9	6.0	1.3	----	----	----	----	2.7	7,600	13,680	2,450	----	----
Same (face of 9 butt heading, 2 main heading),	83,776	B	1	2.7	34.5	56.7	6.1	1.0	----	----	----	----	1.9	7,684	13,830	2,450	----	----
Same (composite of samples 83,771 to 83,776 inclusive).	83,777	B	1	3.0	35.2	55.9	5.9	1.0	5.3	77.7	1.7	8.4	2.2	7,671	13,810	----	----	----
			2	----	36.3	57.6	6.1	1.0	5.2	80.1	1.8	5.8	----	7,908	14,240	----	----	----
			3	----	38.7	61.3	----	1.1	5.5	85.3	1.9	6.2	----	8,422	15,170	----	----	----
Nemacolin; Nemacolin mine, Pittsburgh bed (face of drainage heading, north river flat section).	84,162	B	1	2.7	33.3	56.3	7.7	1.0	----	----	----	----	1.9	7,583	13,650	2,540	----	200
Same (face of 7 road, north river flat section),	84,163	B	1	2.3	33.7	56.9	7.1	1.0	----	----	----	----	1.5	7,677	13,820	2,620	----	----
Same (face of 10 road, north river flat section),	84,164	B	1	2.4	34.1	56.4	7.1	1.0	----	----	----	----	1.6	7,689	13,840	2,220	----	----
Same (face of 305 road, south flat section),	84,165	B	1	2.1	35.2	56.4	6.3	1.1	----	----	----	----	1.3	7,754	13,960	2,340	----	----
Same (face of 313 road, 1 south flat section),	84,166	B	1	2.2	33.5	57.2	7.1	1.6	----	----	----	----	1.4	7,681	13,830	2,240	----	----
Same (left rib, 309 parallel road, 300 feet from 1 south flat section).	84,167	B	1	1.9	35.1	56.8	6.2	1.1	----	----	----	----	1.1	7,782	14,010	2,200	----	----
Same (composite of samples 84,162 to 84,167 inclusive).	84,168	B	1	2.2	34.0	57.0	6.8	1.2	5.2	77.5	1.6	7.7	1.5	7,698	13,860	----	----	----
			2	----	34.8	58.3	6.9	1.2	5.2	79.3	1.6	5.8	----	7,874	14,170	----	----	----
			3	----	37.4	62.6	----	1.3	5.5	85.2	1.8	6.2	----	8,461	15,230	----	----	----
Point Marion, ⅓ mile southwest of; Jeanette mine, Pittsburgh bed (face of 2 right entry, main heading)	84,475	B	1	2.8	36.0	53.8	7.4	2.7	----	----	----	----	2.2	7,583	13,650	2,220	----	200
Same (face of 4 room, 150 feet to the right, from face of main heading).	84,476	B	1	2.9	35.6	53.1	8.4	3.2	----	----	----	----	2.3	7,491	13,480	2,280	----	----
Same (face of 9 room, to left of main parallel entry)	84,477	B	1	2.8	35.5	54.8	6.9	2.6	----	----	----	----	2.2	7,625	13,720	2,280	----	----
Same (composite of samples 84,475 to 84,477 inclusive).	84,878	B	1	2.9	35.9	53.9	7.3	2.7	5.3	75.7	1.5	7.5	2.3	7,551	13,590	----	----	----
			2	----	36.9	55.6	7.5	2.8	5.1	78.0	1.6	5.0	----	7,773	13,990	----	----	----
			3	----	39.9	60.1	----	3.0	5.5	84.3	1.7	5.5	----	8,402	15,130	----	----	----
Poland Station, ½ mile south of; Dunkard No. 1 mine, Sewickley bed (left rib, 2 right entry, 200 feet from main entry).	84,521	B	1	3.3	34.0	54.3	8.4	1.4	----	----	----	----	2.6	7,364	13,250	2,150	----	201
Same (right rib, 2 right entry, 750 feet from main entry).	84,522	B	1	2.8	35.4	53.7	8.1	1.8	----	----	----	----	2.4	7,468	13,440	2,130	----	----
Same (composite of samples 84,521 and 84,522),	84,523	B	1	3.1	34.4	54.3	8.2	1.6	5.1	74.2	1.6	9.3	2.5	7,406	13,330	----	----	----
			2	----	35.5	56.1	8.4	1.6	5.0	76.6	1.6	6.8	----	7,613	13,760	----	----	----
			3	----	38.7	61.3	----	1.8	5.5	83.7	1.8	7.2	----	8,347	15,020	----	----	----
Dunkard No. 2 mine, Pittsburgh bed (face of 7 right butt heading)	81,524	B	1	3.2	36.4	53.4	7.0	2.9	----	----	----	----	3.0	7,585	13,660	2,280	----	201
Same (face of 9 room, 5 right butt heading),	84,525	B	1	3.3	36.3	52.2	8.2	3.2	----	----	----	----	2.8	7,486	13,470	2,280	----	----
Same (face of 3 left butt heading),	84,526	B	1	2.7	37.0	53.7	6.6	2.7	----	----	----	----	2.3	7,643	13,760	2,280	----	----
Same (right rib, 3 right butt heading, 1,000 feet from main heading).	84,527	B	1	2.9	36.3	53.2	7.6	3.0	----	----	----	----	2.5	7,558	13,600	2,230	----	----
Same (composite of samples 84,524 to 84,527 inclusive).	84,528	B	1	3.0	36.9	52.8	7.3	2.9	5.4	74.9	1.4	8.1	2.6	7,541	13,570	----	----	----
			2	----	38.1	54.4	7.5	3.0	5.3	77.2	1.4	5.6	----	7,776	14,000	----	----	----
			3	----	41.2	58.8	----	3.3	5.7	83.5	1.5	6.0	----	8,409	15,140	----	----	----
½ mile north of; Poland No. 3 mine, Pittsburgh bed (face of 1 room, 3 left butt, 8 right flat section).	84,428	B	1	1.8	35.0	55.8	7.4	1.8	----	----	----	----	1.4	7,655	13,780	2,150	----	202
Same (face of 9 right flat entry),	84,429	B	1	1.8	36.2	55.6	6.4	2.1	----	----	----	----	1.4	7,738	13,930	2,180	----	----
Same (face of 4 main heading),	84,430	B	1	2.9	36.4	52.9	7.8	2.3	----	----	----	----	2.5	7,517	13,530	2,110	----	----
Same (face of 9 left flat entry),	84,431	B	1	2.0	36.3	53.5	8.2	3.1	----	----	----	----	1.6	7,586	13,650	2,130	----	----
Same (left rib, 7 left flat entry), 50 feet from face,	84,432	B	1	2.5	35.9	54.9	6.7	2.4	----	----	----	----	2.0	7,600	13,790	2,110	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of *mine samples*—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
GREENE COUNTY—Continued																		
Same (composite of samples 84,428 to 84,432 inclusive).	84,433	B	1	2.2	35.9	54.6	7.3	2.4	5.3	76.6	1.6	6.8	1.8	7,620	13,720	-----	-----	-----
			2	-----	36.7	55.8	7.5	2.5	5.2	78.3	1.6	4.9	-----	7,794	14,030	-----	-----	-----
			3	-----	39.7	60.3	-----	2.7	5.6	84.6	1.7	5.4	-----	8,423	15,160	-----	-----	-----
½ mile northwest of; Rosedale No. 2 mine, Sewickley bed (face of main dip heading).	84,479	B	1	2.5	34.0	55.3	8.2	1.3	-----	-----	-----	-----	1.9	7,450	13,410	2,620	-----	203
Same (face of 7 left face heading),	84,480	B	1	2.4	36.0	53.6	8.0	2.3	-----	-----	-----	-----	1.8	7,526	13,550	2,220	-----	-----
Same (face of 3 right face heading),	84,481	B	1	3.1	36.4	51.7	8.8	3.0	-----	-----	-----	-----	2.5	7,401	13,320	2,220	-----	-----
Same (composite of samples 84,479 to 84,481 inclusive).	84,482	B	1	2.7	35.3	54.0	8.0	2.1	5.2	74.6	1.6	8.5	2.1	7,449	13,410	-----	-----	-----
			2	-----	36.2	55.6	8.2	2.1	5.1	76.6	1.6	6.4	-----	7,647	13,760	-----	-----	-----
			3	-----	39.5	60.5	-----	2.3	5.5	83.6	1.8	6.8	-----	8,340	15,010	-----	-----	-----
Rices Landing; Dilworth mine, Pittsburgh bed (face of 9 left butt heading, 2 north entry).	83,892	B	1	2.1	36.2	53.1	8.6	2.4	-----	-----	-----	-----	1.3	7,534	13,560	2,170	-----	203
Same (face of 5 room, 10 right butt heading),	83,893	B	1	2.7	35.0	53.4	8.9	2.3	-----	-----	-----	-----	1.9	7,439	13,390	2,150	-----	-----
Same (face of 10 right butt heading),	83,894	B	1	3.4	34.3	52.6	9.7	2.3	-----	-----	-----	-----	2.7	7,300	13,140	2,150	-----	-----
Same (face of 2 south heading),	83,895	B	1	3.3	33.3	53.1	10.3	1.4	-----	-----	-----	-----	2.6	7,246	13,040	2,150	-----	-----
Same (face of straight main heading),	83,896	B	1	3.4	34.2	54.4	8.0	1.4	-----	-----	-----	-----	2.7	7,465	13,440	2,370	-----	-----
Same (composite of samples 83,892 to 83,896 inclusive).	83,897	B	1	2.9	34.5	53.6	9.0	1.9	5.2	74.8	1.6	7.5	2.2	7,417	13,350	-----	-----	-----
			2	-----	35.5	55.2	9.3	2.0	5.0	77.0	1.6	5.1	-----	7,639	13,750	-----	-----	-----
			3	-----	39.1	60.9	-----	2.2	5.5	84.9	1.8	5.6	-----	8,422	15,160	-----	-----	-----
½ mile west of; Hogg country bank, Waynesburg bed (at face, 75 feet northwest of mine mouth).	84,052	B	1	3.3	33.0	47.0	16.7	3.5	-----	-----	-----	-----	2.5	6,619	11,910	2,240	-----	203
			2	-----	34.2	48.6	17.2	3.6	-----	-----	-----	-----	-----	6,847	12,320	-----	-----	-----
Ryerson Station; Country bank, Washington bed (lower bench).	1,239	B	1	2.2	36.8	47.0	14.0	3.8	-----	-----	-----	-----	-----	-----	-----	-----	22	-----
			2	-----	37.6	48.0	14.4	3.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Waynesburg, 2 miles southeast of; Guthrie mine, Waynesburg bed (right rib, 1 right entry, at air-break, 175 feet from outcrop).	83,811	B	1	4.2	32.8	47.0	16.0	1.9	-----	-----	-----	-----	2.4	6,615	11,910	2,450	-----	204
Same (face of 3 left entry, main heading),	83,812	B	1	3.2	33.4	44.9	18.5	3.1	-----	-----	-----	-----	2.1	6,434	11,580	2,570	-----	-----
Same (composite of samples 83,811 and 83,812),	83,813	B	1	3.4	32.8	46.7	17.1	2.4	4.9	65.4	1.4	8.8	2.3	6,529	11,750	-----	-----	-----
			2	-----	34.0	48.3	17.7	2.5	4.7	67.7	1.4	6.0	-----	6,759	12,160	-----	-----	-----
			3	-----	41.3	58.7	-----	3.0	5.7	82.3	1.7	7.3	-----	8,213	14,780	-----	-----	-----

2 miles southeast of; **Mordock mine, Waynesburg bed** (face of 1 left entry)	83,814	B	1	3.2	33.5	45.7	17.6	3.7					2.2	6,510	11,720	2,390		204
Same (face of 10 room, left of main heading)	83,815	B	1	3.4	34.1	46.9	15.6	3.2					2.4	6,686	12,030	2,450		
Same (composite of samples 83,814 and 83,815)	83,816	B	1	3.3	33.5	46.7	16.5	3.3	4.9	65.8	1.3	8.2	2.3	6,611	11,900			
			2		34.6	48.3	17.1	3.4	4.7	68.0	1.3	5.5		6,837	12,310			
			3		41.7	58.3		4.1	5.7	82.0	1.6	6.6		8,247	14,850			
4 miles east of; **Pratt Hill mine, Waynesburg bed** (face of 1 left entry)	83,782	B	1	3.4	33.7	49.8	13.1	1.8					2.1	6,896	12,410	2,680		205
			2		34.9	51.5	13.6	1.9						7,139	12,850			
HUNTINGDON COUNTY																		
Jacobs; **Barnett mine, Lower Kittanning bed** (level heading, 600 feet from mine mouth)	10,319	A	1	2.1	18.2	73.4	6.3	.8					1.6	8,006	14,410	3,010	22	
			2		18.6	75.0	6.4	.8						8,179	14,720			
Jacobs mine, Fulton bed (last room, dip air-course, 1,000 feet from mine mouth)	10,315	A	1	1.7	17.5	72.5	8.3	1.8					1.3	7,844	14,120	2,770	22	
Same (level heading, 3,300 feet from mine mouth)	10,316	A	1	2.0	17.4	72.0	8.6	1.5					1.5	7,761	13,970	3,010	22	
Same (face of 31 room, level heading, 2,800 feet from mine mouth)	10,317	A	1	1.6	17.6	72.2	8.6	1.5					1.2	7,828	14,090	2,910	22	
Same (composite of samples 10,317 inclusive)	10,333	A	1	1.7	17.5	72.2	8.6	1.6	4.6	80.6	1.4	3.2	1.3	7,822	14,080		22	
			2		17.8	73.4	8.8	1.6	4.5	82.0	1.4	1.7		7,950	14,310			
			3		19.5	80.5		1.7	4.9	89.9	1.5	2.0		8,711	15,680			
3½ miles south of; **Starr mine, Fulton bed** (west rib, near face of right heading, 150 feet from mine mouth)	10,318	A	1	3.0	17.1	71.8	8.1	1.1					1.9	7,667	13,800	3,010	22	
			2		17.7	74.0	8.3	1.1						7,900	14,220			
Robertsdale; Robertsdale mine, Lower Kittanning bed (face **of 6** north heading)	12,115	A	1	2.3	14.8	76.5	6.4	1.4					1.6	8,039	14,470	2,370	85	
Same (face of main west heading)	12,116	A	1	1.9	15.2	77.3	5.6	.8					1.2	8,128	14,630	3,010	85	
Same (face of 6 south heading)	12,117	A	1	2.0	14.6	76.2	7.2	.9					1.3	7,983	14,370	3,010	85	
Same (face of 8 south heading)	12,118	A	1	2.2	13.9	77.5	6.4	1.1					1.5	8,044	14,480	3,010	85	
Same (face of 5 south heading)	12,119	A	1	2.3	15.6	75.6	6.5	1.0					1.7	8,036	14,410	3,070	85	
Same (composite of samples 12,115 to 12,119 inclusive)	12,120	A	1	2.1	15.5	76.0	6.4	1.1	4.4	82.8	1.3	4.0	1.5	8,039	14,470		85	
			2		15.8	77.6	6.6	1.1	4.3	84.6	1.3	2.1		8,217	14,790			
			3		16.9	83.1		1.2	4.6	90.6	1.4	2.2		8,794	15,830			
Woodvale; Woodvale mine, Lower Kittanning bed (face of 1 south heading)	12,121	A	1	2.9	14.3	76.7	6.1	.9					2.2	8,000	14,400	3,070	85	
Same (face of 3 south or up-creek heading)	12,122	A	1	2.0	13.4	79.2	5.4	.9					1.3	8,161	14,690	3,010	85	
Same (face of 2 west tunnel)	12,123	A	1	1.9	14.1	78.1	5.9	.9					1.3	8,117	14,610	3,010	85	
Same (face of No. 7 or Bolinger heading)	12,124	A	1	2.4	15.3	75.5	6.8	1.8					1.7	7,939	14,290		85	
Same (composite of samples 12,121 to 12,124 inclusive)	12,125	A	1	2.2	14.1	77.6	6.1	1.1	4.5	83.3	1.3	3.7	1.6	8,083	14,550		85	
			2		14.4	79.3	6.3	1.2	4.3	85.2	1.3	1.7		8,267	14,880			
			3		15.3	84.7		1.3	4.6	90.9	1.4	1.8		8,817	15,870			
INDIANA COUNTY																		
Black Lick, 2 miles west of; Clawson custom bank, Pittsburgh bed (face of main entry, 300 feet south of mine mouth)	85,501	B	1	2.0	29.3	58.4	10.3	2.2					1.7	7,511	13,520	2,180		205
			2		29.9	59.6	10.5	2.2						7,667	13,800			
Clarksburg, 1⅓ miles northwest of; Brown mine, Pittsburgh bed (face of main heading, 400 feet east of mine mouth)	85,582	B	1	2.2	32.6	54.9	10.3	1.7					1.4	7,411	13,340	2,600		205
			2		33.3	56.2	10.5	1.8						7,583	13,650			
Clymer, 1 mile north of; **Empire R mine, Lower Kittanning bed** (pillar, 28 room, 2 left entry, main entry 2,200 feet east of mine mouth)	W19,681	A	1	2.1	26.5	64.9	6.5	1.7						7,972	14,350		85	
Same (crosscut at corner of 47 room, 1 left entry, main entry, 4,700 feet southeast of mine mouth)	W19,679	A	1	2.3	26.6	63.3	7.8	2.7						7,839	14,110		85	

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
HUNTINGDON COUNTY—Continued.																		
Same (face of 3 room, 1 right entry, main entry, 1,100 feet south of mine mouth)	W19,683	A	1	2.0	26.6	64.4	7.0	1.9						7,961	14,330		85	
Same (face of 11 room, 5 left entry, main entry, 1,900 feet southeast of mine mouth)	W19,684	A	1	2.2	26.0	64.5	7.3	2.2						7,850	14,130		85	
Same (near face of 43 room, 4 left entry, main entry, 3,100 feet from mine mouth)	W19,686	A	1	1.9	26.6	64.7	6.8	2.2						7,972	14,350		85	
Same (composite of samples W19,679, W19,683, W19,684 and W19,686)	12,219	A	1	1.2	26.4	64.8	7.6	2.4	5.0	79.9	1.4	3.7		7,944	14,300		85	
			2		26.7	65.6	7.7	2.4	4.9	80.9	1.4	2.7		8,044	14,480			
			3		28.9	71.1		2.6	5.3	87.6	1.5	3.0		8,706	15,670			
Pen-Mary No. 1 mine, Upper Freeport bed (face of 3 right heading, town drift)	7,972	B	1	3.6	23.6	67.3	5.5	1.3	5.0	79.8	1.3	7.1	2.7	7,889	14,200		22	
			2		24.4	69.9	5.7	1.4	4.8	82.8	1.4	3.9		8,189	14,740			
			3		25.9	74.1		1.4	5.0	87.8	1.4	4.4		8,678	15,620			
Same (face of 1 right heading)	7,973	B	1	4.0	23.4	67.4	5.2	.9					3.0	7,878	14,180		22	
			2		24.3	70.3	5.4	.9						8,206	14,770			
Rodkey mine, Lower Kittanning bed (at face, 1,400 feet from mine mouth)	7,969	B	1	2.1	24.5	66.0	7.4	2.2	5.1	79.4	1.2	4.7	1.3	7,872	14,170		22	
			2		25.0	67.4	7.6	2.2	5.0	81.1	1.2	2.9		8,039	14,470			
			3		27.0	73.0		2.4	5.4	87.7	1.3	3.2		8,694	15,650			
Same (face of main entry)	7,971	B	1	2.3	25.8	66.0	5.9	1.5					1.6	7,978	14,360		22	
			2		26.4	67.5	6.1	1.6						8,167	14,700			
1½ miles north of; Empire M. (McKean) mine, Lower Kittanning bed (corner of pillar of 44 room, 1 right entry, main entry)	W19,682	A	1	2.2	26.4	64.6	6.8	2.0						7,956	14,320		85	
			2		27.0	66.0	7.0	2.0						8,133	14,640			
Same (face of 56 room, 2 right entry, main entry, 4,000 feet east of mine mouth)	W19,678	A	1	1.9	26.5	64.0	7.6	2.4						7,911	14,240		85	
Same (corner of crosscut at 40 room, 2 right entry, main entry, 3,000 feet southeast of mine mouth)	W19,680	A	1	2.1	26.5	63.4	8.0	2.3						7,811	14,060		85	
Same (face of first parallel, south heading, 1 right entry, main entry, 2,800 feet southwest of mine mouth)	W19,685	A	1	2.8	26.4	64.4	6.4	1.7						7,917	14,250		85	
Same (face of third parallel, south heading 1 right entry, main entry)	W19,687	A	1	2.5	26.9	63.9	6.7	1.7						7,917	14,250		85	

Same (composite of samples W19,678, W19,680, W19,685 and W19,687)	12,223	A	1	1.3	26.7	64.4	7.6	2.0	5.0	80.4	1.4	3.6		7,956	14,320		85	
			2		27.1	65.2	7.7	2.1	4.9	81.4	1.4	2.5		8,056	14,500			
			3		29.3	70.7		2.2	5.4	88.2	1.5	2.7		8,472	15,710			
Coral, ¼ mile east of; Coral mine, Upper Freeport bed (face of 8 room, 4 flat section)	85,506	B	1	1.6	24.1	67.6	6.7	.7					1.4	7,889	14,200	2,800		206
Same (face of 19 room, 2 slope, 3½ flat section)	85,507	B	1	1.8	24.7	66.5	7.0	.9					1.3	7,856	14,140	2,200		
Same (face of 7 room, 4 butt heading, 2 slope, 3 flat section)	85,508	B	1	2.2	24.5	65.9	7.4	1.3					1.7	7,772	13,990	2,150		
Same (face of 1 room, 2 slope, 2½ flat section)	85,509	B	1	2.0	24.3	65.7	8.0	1.1					1.5	7,767	13,980	2,200		
Same (composite of samples 85,506 to 85,509 inclusive)	85,510	B	1	1.9	24.8	65.9	7.4	1.0	4.9	80.1	1.7	4.9	1.5	7,828	14,090			
			2		25.3	67.2	7.5	1.0	4.8	81.7	1.8	3.2		7,983	14,370			
			3		27.4	72.6		1.1	5.2	88.3	1.9	3.5		8,628	15,530			
Dilltown, ¼ mile north of; Dilltown Smokeless No. 1 mine, Lower Kittanning bed (face of 5 left A entry)	85,061	A	1	2.1	23.3	66.5	8.1	3.4					2.0	7,761	13,970	1,910		206
Same (face of main heading)	85,062	A	1	2.2	22.6	65.8	9.4	3.9					2.0	7,606	13,690	1,910		
Same (face of 1 room, F heading, 1 left heading)	85,063	A	1	2.5	23.5	66.6	7.4	2.5					2.3	7,789	14,020	1,960		
Same (composite of samples 85,061 to 85,063 inclusive)	85,064	A	1	2.2	23.1	66.4	8.3	3.3	4.8	78.2	1.3	4.1	2.1	7,722	13,900			
			2		23.6	67.9	8.5	3.4	4.6	80.0	1.3	2.2		7,900	14,220			
			3		25.8	74.2		3.7	5.1	87.4	1.4	2.4		8,628	15,530			
Ernest; Ernest No. 2 mine, Upper Freeport bed (face of 4 room, butt entry, 15 right entry, 4 line entry, 14 right entry)	24,191	A	1	3.0	30.8	55.2	11.0	3.1	5.0	73.5	1.2	6.2	2.3	7,372	13,270	2,240	123	
			2		31.7	56.9	11.4	3.2	4.8	75.8	1.3	3.5		7,600	13,680			
			3		35.8	64.2		3.7	5.5	85.5	1.4	3.9		8,572	15,430			
Same (near face of 2 room, 14½ entry, inby side of rib stump, just inby 1 break-through, to 1 room)	24,192	A	1	2.1	31.0	57.1	9.8	2.6	5.0	75.7	1.3	5.6	1.4	7,536	13,600	2,190	123	
			2		31.6	58.3	10.1	2.6	4.9	77.4	1.3	3.7		7,717	13,890			
			3		35.2	64.8		2.9	5.4	86.0	1.5	4.2		8,578	15,440			
Glen Campbell; Electric No. 8 mine, Upper Kittanning bed (face of main aircourse, 300 feet from mine mouth).	75,812	B	1	2.7	27.4	60.4	9.5	1.5					1.9	7,478	13,460	2,630		207
Same (face of main heading, 500 feet from mine mouth)	75,813	B	1	2.6	27.2	59.9	10.3	1.6					1.9	7,433	13,380	2,510		
Same (composite of samples 75,812 and 75,813)	75,814	B	1	2.6	27.1	60.5	9.8	1.6	4.9	76.1	1.3	6.3	1.9	7,433	13,380			
			2		27.8	62.1	10.1	1.6	4.8	78.2	1.4	3.9		7,633	13,740			
			3		30.9	69.1		1.8	5.3	86.9	1.5	4.5		8,494	15,290			
Glenwood No. 9 mine, Upper Kittanning bed (1 right cross heading, 2,000 ft. northwest of mine mouth)	5,224	A	1	3.5	23.1	67.1	6.3	1.0					2.3	7,806	14,050		22	
			2		23.9	69.6	6.5	1.1						8,089	14,560			
Same (face of 37 room, 2 right entry, 2,900 feet northwest of mine mouth)	5,228	A	1	3.3	23.4	67.6	5.7	.9					1.7	7,922	14,260		22	
			2		24.1	70.0	5.9	1.0						8,189	14,740			
1 mile east of; Falcon No. 8 mine, Middle Kittanning bed (face of 2 left heading, ¼ mile from mine mouth)	75,820	B	1	2.8	26.0	61.9	9.3	1.8					1.8	7,500	13,500	2,830		207
			2		26.7	63.8	9.5	1.8						7,711	13,880			
Falcon No. 9 mine, Lower Freeport bed (face of main heading, 400 yds. north of mine mouth)	75,821	B	1	3.0	26.1	58.5	12.4	2.7					2.1	7,200	12,960	2,390		208
			2		26.9	60.3	12.8	2.8						7,422	13,360			
2 miles northeast of, on Horton Run; Indiana No. 2 mine, Lower Freeport bed (face of 2 right heading, 1,000 feet north of mine mouth)	5,222	A	1	3.4	24.0	65.9	6.7	.7					2.4	7,861	14,150		22	
			2		24.8	68.2	7.0	.7						8,139	14,650			
Indiana No. 3 mine, Upper Freeport bed (face of 10 right heading, 3,000 feet west of mine mouth)	5,225	A	1	2.7	27.6	60.7	9.0	1.6					1.6	7,706	13,870		22	
			2		28.3	62.4	9.3	1.7						7,928	14,270			
Same (face of back heading, straight heading)	5,229	A	1	2.9	25.6	63.1	8.4	2.1					1.2	7,711	13,880		22	
			2		26.4	65.0	8.6	2.2						7,933	14,280			
Indiana No. 6 mine, Upper Freeport bed (face of 7 left heading, main entry, 3,000 feet northwest of mine mouth)	12,102	A	1	3.0	27.4	61.3	8.3	1.3					1.8	7,650	13,770	2,510	85	
Same (face of 10 room, 1 left entry, main heading, 1,000 feet northeast of mine mouth)	12,103	A	1	2.9	26.9	61.7	8.5	1.2					1.7	7,622	13,720	2,550	85	

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
INDIANA COUNTY—Continued.																		
Same (rib, near face of 14 room, 7 right heading, main entry, 2,000 feet northwest of mine mouth)	12,104	A	1	3.7	27.0	61.1	8.2	1.2	-----	-----	-----	-----	2.5	7,611	13,700	2,410	85	-----
Same (face of 6 left heading, main entry, 2,200 feet southwest of mine mouth)	12,105	A	1	2.9	27.9	60.3	8.9	1.7	-----	-----	-----	-----	1.7	7,611	13,700	-----	85	-----
Same (near face of 1 room, 8 right heading, main entry, 2,300 feet northwest of mine mouth)	12,106	A	1	3.2	27.4	61.1	8.3	1.3	-----	-----	-----	-----	1.9	7,611	13,700	2,490	85	-----
Same (composite of samples 12,102 to 12,106 inclusive)	12,107	A	1	3.1	27.3	61.2	8.4	1.3	5.0	76.7	1.3	7.3	1.9	7,650	13,770	-----	85	-----
			2	-----	28.2	63.1	8.7	1.3	4.8	79.2	1.3	4.7	-----	7,894	14,210	-----	-----	-----
			3	-----	30.9	69.1	-----	1.5	5.3	86.7	1.4	5.1	-----	8,650	15,570	-----	-----	-----
3 miles southwest of; Hillsdale No. 6 mine, Upper Freeport bed (face of 3 right heading, 300 yds. from mine mouth)	75,819	B	1	3.7	27.6	58.3	10.4	1.7	-----	-----	-----	-----	2.6	7,328	13,190	2,450	-----	208
			2	-----	28.6	60.6	10.8	1.8	-----	-----	-----	-----	-----	7,606	13,690	-----	-----	-----
Gypsy, ½ mile south of; Trojan mine, Lower Freeport bed (face of 2 left heading, 300 yds. from mine mouth)	75,818	B	1	2.9	31.0	60.5	5.6	2.2	-----	-----	-----	-----	1.8	7,883	14,190	2,250	-----	208
			2	-----	32.0	62.2	5.8	2.2	-----	-----	-----	-----	-----	8,122	14,620	-----	-----	-----
Homer City, 1 mile east of; Lucerne No. 1 mine, Upper Freeport bed (face of 3 right entry, 3,000 feet east of mine mouth)	10,306	A	1	3.0	27.4	60.4	9.2	3.3	-----	-----	-----	-----	2.2	7,578	13,640	2,080	22	-----
Same (face of 7 right entry, 2,500 feet northeast of mine mouth)	10,307	A	1	2.4	27.6	60.0	10.0	3.0	-----	-----	-----	-----	1.6	7,556	13,600	-----	22	-----
Same (face of 11 right entry, 3,500 feet northeast of mine mouth)	10,308	A	1	3.0	25.7	63.6	7.7	1.2	-----	-----	-----	-----	2.2	7,750	13,950	2,590	22	-----
Same (face of back heading, 3,500 feet northeast of mine mouth)	10,309	A	1	3.2	26.1	63.0	7.7	2.3	-----	-----	-----	-----	2.5	7,683	13,830	2,380	22	-----
Same (face of 5 left entry, 3,200 feet north of mine mouth)	10,310	A	1	5.3	26.0	62.8	5.9	1.4	-----	-----	-----	-----	4.5	7,672	13,810	2,260	22	-----
Same (face of 3 left entry, 3,000 feet northwest of mine mouth)	10,311	A	1	3.2	26.6	61.9	8.3	2.2	-----	-----	-----	-----	2.5	7,656	13,780	2,150	22	-----
Same (face of 7 right heading, 1 left entry, 3,000 feet northwest of mine mouth)	10,312	A	1	4.1	26.2	62.3	7.4	1.9	-----	-----	-----	-----	3.4	7,672	13,810	2,260	22	-----

Same (composite of samples 10,306 to 10,312 inclusive)	10,313	A	1	3.3	26.2	62.4	8.1	2.2	5.1	77.1	1.4	6.1	2.7	7,650	13,770	-----	22	-----
			2	-----	27.1	64.5	8.4	2.3	4.9	79.7	1.4	3.3	-----	7,911	14,240	-----	-----	-----
			3	-----	29.6	70.4	-----	2.5	5.3	87.0	1.6	3.6	-----	8,639	15,550	-----	-----	-----
Lucerne No. 3 mine, Upper Freeport bed (face of main north heading, 700 feet from shaft bottom)	10,303	A	1	2.9	26.9	62.0	8.2	1.9	-----	-----	-----	-----	2.2	7,667	13,800	2,190	22	-----
Same (face of 4 left heading, 3 south entry, 800 feet from shaft bottom)	10,304	A	1	5.5	25.2	61.7	7.6	1.9	-----	-----	-----	-----	4.7	7,511	13,520	2,190	22	-----
Same (face of 1 west heading, main south entry, 600 feet from shaft bottom)	10,305	A	1	6.4	24.8	61.0	7.8	1.9	-----	-----	-----	-----	5.6	7,428	13,370	2,350	22	-----
Same (composite of samples 10,303 to 10,305 inclusive)	10,314	A	1	5.0	26.0	61.2	7.8	1.9	5.2	76.2	1.4	7.5	4.2	7,533	13,560	-----	22	-----
			2	-----	27.4	64.4	8.2	2.0	4.9	80.3	1.5	3.1	-----	7,933	14,280	-----	-----	-----
			3	-----	29.9	70.1	-----	2.2	5.4	87.4	1.6	3.4	-----	8,639	15,550	-----	-----	-----
1 mile northwest of; Tearing Run mine, Upper Freeport bed (No. 4 stump, 1 right entry, main entry)	W20,431	A	1	2.6	24.5	64.8	8.1	2.5	-----	-----	-----	-----	-----	7,739	13,930	-----	85	-----
Same (rib of 10 room, 1 left entry, main entry)	W20,428	A	1	2.6	26.5	61.7	9.2	2.8	-----	-----	-----	-----	-----	7,622	13,720	-----	85	-----
Same (face of 2 right entry, main entry)	W20,429	A	1	2.8	23.8	64.1	9.3	2.7	-----	-----	-----	-----	-----	7,550	13,590	-----	85	-----
Same (rib near face of 2 left entry, main entry)	W20,430	A	1	2.3	24.6	64.6	8.5	2.2	-----	-----	-----	-----	-----	7,728	13,910	-----	85	-----
Same ("shoo-fly", 100 feet below 2 left entry, main entry)	W20,432	A	1	2.0	24.4	65.2	8.4	2.2	-----	-----	-----	-----	-----	7,872	14,170	-----	85	-----
Same (composite of samplles W20,428 to W20,420 inclusive and W20,432)	12,373	A	1	1.0	26.1	63.8	9.1	2.7	4.7	78.1	1.1	4.3	-----	7,750	13,950	-----	85	-----
			2	-----	26.3	64.5	9.2	2.7	4.6	78.9	1.1	3.5	-----	7,828	14,090	-----	-----	-----
			3	-----	29.0	71.0	-----	3.0	5.1	86.9	1.2	3.8	-----	8,622	15,520	-----	-----	209
2 miles east of; Tide No. 2 mine, Lower Kittanning bed (face of 6 left butt heading, main dip heading)	85,536	B	1	2.2	26.3	63.3	8.2	3.3	-----	-----	-----	-----	2.1	7,711	13,880	2,010	-----	-----
Same (face of main dip heading, 4,000 feet from mine mouth)	85,537	B	1	3.7	25.6	61.9	8.8	3.4	-----	-----	-----	-----	3.5	7,511	13,520	2,010	-----	-----
Same (left rib, 3 left butt heading, main dip heading, 300 feet from main dip)	85,538	B	1	3.0	24.5	64.8	7.7	3.2	-----	-----	-----	-----	2.4	7,689	13,840	2,200	-----	-----
Same (composite of samples 85,536 to 85,538 inclusive)	85,539	B	1	3.0	25.5	63.2	8.3	3.3	5.0	76.5	1.3	5.6	2.7	7,644	13,760	-----	-----	-----
			2	-----	26.3	65.2	8.5	3.4	4.8	78.9	1.4	3.0	-----	7,883	14,190	-----	-----	-----
			3	-----	28.7	71.3	-----	3.7	5.2	86.2	1.5	3.4	-----	8,617	15,510	-----	-----	-----
Josephine, ½ mile east of; Bells Mill mine, Lower Kittanning bed (face of main flat entry, 5,000 feet from mine mouth)	85,502	B	1	2.2	24.6	64.5	8.7	3.0	-----	-----	-----	-----	1.9	7,700	13,860	2,060	-----	209
Same (face of 10 right butt heading, main dip heading)	85,503	B	1	2.1	24.5	66.0	7.4	2.0	-----	-----	-----	-----	1.9	7,850	14,130	2,180	-----	-----
Same (face of main dip heading, 5,000 feet from mine mouth)	85,504	B	1	2.7	23.4	64.8	9.1	3.4	-----	-----	-----	-----	2.5	7,617	13,710	2,200	-----	-----
Same (composite of samples 85,502 to 85,504 inclusive)	85,505	B	1	2.3	24.8	64.5	8.4	2.8	4.9	77.9	1.3	4.7	2.1	7,700	13,860	-----	-----	-----
			2	-----	25.4	66.0	8.6	2.9	4.7	79.7	1.4	2.7	-----	7,878	14,180	-----	-----	-----
			3	-----	27.7	72.3	-----	3.2	5.2	87.3	1.5	2.8	-----	8,622	15,520	-----	-----	-----
Kent, 2 miles southeast of; Aultman mine No. 5, Upper Freeport bed (right rib, 2 right entry, 2,400 feet from main heading)	85,763	B	1	2.2	29.5	59.9	8.4	1.5	-----	-----	-----	-----	1.3	7,633	13,740	2,340	-----	209
Same (right rib, 7 left entry, 3,000 feet from main heading)	85,764	B	1	2.3	27.7	60.5	9.5	1.4	-----	-----	-----	-----	1.6	7,528	13,550	2,450	-----	-----
Same (left rib, 500 feet from face of main heading 7,000 feet south of mine mouth)	85,765	B	1	1.8	28.4	60.5	9.3	2.1	-----	-----	-----	-----	1.2	7,611	13,700	2,170	-----	-----
Same (composite of samples 85,763 to 85,765 inclusive)	85,766	B	1	2.1	28.7	60.0	9.2	1.6	4.9	76.7	1.4	6.2	1.3	7,578	13,640	-----	-----	-----
			2	-----	29.3	61.3	9.4	1.6	4.8	78.4	1.5	4.3	-----	7,739	13,930	-----	-----	-----
			3	-----	32.4	67.6	-----	1.8	5.3	86.5	1.6	4.8	-----	8,539	15,370	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
INDIANA COUNTY—Continued.																		
Locust, ⅓ mile south of; Locust mine, Upper Freeport bed (face of south heading, 1 right heading, ¼ mile from mine mouth).	75,750	B	1	3.3	34.1	54.7	7.9	2.9	-----	-----	-----	-----	2.3	7,572	13,630	2,280	-----	210
Same (face of 5 room, 1 right heading, ¼ mile from mine mouth).	75,751	B	1	2.8	29.8	57.3	10.1	3.6	-----	-----	-----	-----	1.9	7,417	13,350	2,140	-----	-----
Same (composite of samples 75,750 and 75,751).	75,752	B	1	3.2	31.0	57.0	8.8	3.1	5.2	75.4	1.5	6.0	2.1	7,517	13,530	-----	-----	-----
			2	-----	32.1	58.8	9.1	3.2	5.0	77.9	1.5	3.3	-----	7,767	13,980	-----	-----	-----
			3	-----	35.3	64.7	-----	3.5	5.5	85.7	1.7	3.6	-----	8,544	15,380	-----	-----	-----
Robindale; Robindale mine, Lower Kittanning bed (face of aircourse, dip heading).	25,135	A	1	1.4	18.9	70.5	9.2	2.4	-----	-----	-----	-----	.9	7,772	13,990	2,400	123	-----
Same (face of 1 room, 1 north parallel).	25,136	A	1	2.5	18.2	71.7	7.6	2.1	-----	-----	-----	-----	2.0	7,922	14,260	2,470	123	-----
Same (face of 1 left main heading)	25,137	A	1	2.4	20.1	70.9	6.6	2.0	-----	-----	-----	-----	2.0	7,922	14,260	2,440	123	-----
Same (30 feet from foot at face of proposed drainageway to dip heading).	25,138	A	1	2.6	19.7	70.3	7.4	2.2	-----	-----	-----	-----	2.1	7,844	14,120	2,460	123	-----
Same (composite of samples 25,135 to 25,138 inclusive).	25,139	A	1	2.2	19.2	70.9	7.7	2.2	4.8	80.6	1.3	3.4	1.7	7,828	14,090	-----	123	-----
			2	-----	19.7	72.4	7.9	2.3	4.7	82.4	1.3	1.4	-----	8,006	14,410	-----	-----	-----
			3	-----	21.4	78.6	-----	2.5	5.1	89.5	1.4	1.5	-----	8,694	15,650	-----	-----	-----
Rossiter; Clearfield No. 3 mine, Upper Freeport bed (5,100 feet southwest of mine mouth)	5,223	A	1	4.3	26.6	60.3	8.8	1.9	-----	-----	-----	-----	2.9	7,456	13,420	-----	22	-----
Same (7,900 feet southwest of mine mouth).	5,226	A	1	2.8	25.7	62.5	9.0	2.0	-----	-----	-----	-----	1.2	7,611	13,700	-----	22	-----
Scot Glen, ½ mile southwest of; Brush Valley mine, Lower Kittanning bed (face of 6 right entry, 4,450 feet southwest of mine mouth)	22,501	A	1	5.2	20.6	66.4	7.8	3.1	-----	-----	-----	-----	4.7	7,617	13,710	2,200	123	-----
Same (pillar in 30 room, 280 feet from 7 right heading, 3,300 feet southwest of mine mouth).	22,502	A	1	2.2	22.7	67.5	7.6	2.8	-----	-----	-----	-----	1.6	7,906	14,230	2,330	123	-----
Same (face of 8 right back entry, 3,400 feet southwest of mine mouth).	22,503	A	1	4.2	20.6	67.3	7.9	2.6	-----	-----	-----	-----	3.6	7,706	13,870	2,240	123	-----
Same (face of 11 right entry, 10 feet from main entry, 3,675 feet southwest of mine mouth).	22,504	A	1	3.0	20.8	68.4	7.8	2.8	-----	-----	-----	-----	2.4	7,800	14,040	2,200	123	-----

Same (face of 1 butt back entry, 5 left entry, 2,025 feet southwest of mine mouth).	22,505	A	1	3.2	20.5	68.4	7.9	3.2	----	----	----	----	2.7	7,794	14,030	2,280	123	----
Same (composite of samples 22,501 to 22,505 inclusive).	22,506	A	1	3.6	20.9	67.6	7.9	2.9	5.0	78.2	1.3	4.7	3.0	7,744	13,940	----	123	----
			2	----	21.7	70.1	8.2	3.0	4.8	81.0	1.3	1.7	----	8,028	14,450	----	----	----
			3	----	23.7	76.3	----	3.3	5.2	88.3	1.4	1.8	----	8,744	15,740	----	----	----
Strangford; Strangford mine, Upper Freeport bed (face of 23 butt heading, dip flat heading).	85,657	B	1	2.6	27.0	62.3	8.1	.9	----	----	----	----	1.9	7,689	13,840	2,740	----	210
Same (face of 1 room, 28 right heading, main flat heading).	85,658	B	1	2.2	27.5	58.9	11.4	3.2	----	----	----	----	1.6	7,383	13,290	2,140	----	----
Same (face of 1 room, 29 right heading, main flat heading).	85,659	B	1	2.4	28.5	57.8	11.3	2.6	----	----	----	----	1.8	7,389	13,300	2,260	22	----
Same (composite of samples 85,657 to 85,659 inclusive).	85,660	B	1	2.3	27.6	59.9	10.2	2.3	4.9	75.6	1.3	5.7	1.8	7,489	13,480	----	----	----
			2	----	28.2	61.4	10.4	2.3	4.7	77.4	1.4	3.8	----	7,661	13,790	----	----	----
			3	----	31.5	68.5	----	2.6	5.3	86.4	1.5	4.2	----	8,556	15,400	----	----	----
Tunnelton, ½ mile west of; Tunnelton mine, Upper Freeport bed (face of 1 butt heading, 10 left heading, 7,000 feet north of mine mouth).	85,601	B	1	2.4	30.6	57.7	9.3	2.5	----	----	----	----	1.7	7,533	13,560	2,220	----	210
Same (face of 7 room, 2 left heading, 3,000 feet northwest of mine mouth).	85,602	B	1	2.2	30.8	57.6	9.4	1.9	----	----	----	----	1.5	7,550	13,590	2,200	----	----
Same (left rib, 2 left heading, 1,500 feet north of mine mouth).	85,603	B	1	2.5	30.6	58.0	8.9	2.2	----	----	----	----	1.9	7,544	13,580	2,240	----	----
Same (composite of samples 85,601 to 85,603 inclusive).	85,604	B	1	2.3	30.5	58.1	9.1	2.2	5.1	75.5	1.4	6.7	1.7	7,544	13,580	----	----	----
			2	----	31.3	59.3	9.4	2.3	4.9	77.3	1.4	4.7	----	7,722	13,900	----	----	----
			3	----	34.5	65.5	----	2.5	5.4	85.3	1.5	5.3	----	8,522	15,340	----	----	----
Wehrum; Lackawanna No. 4 mine, Lower Kittanning bed (at face, ½ mile from mine mouth).	3,774	A	1	2.6	18.9	70.3	8.2	4.0	----	----	----	----	2.0	----	----	----	22	----
Same (2,000 feet northeast of shaft).	4,026	A	1	3.8	19.0	67.9	9.3	4.6	----	----	----	----	3.3	----	----	----	22	----
Same (1,900 feet southwest of shaft)	4,027	A	1	2.8	17.5	71.4	8.3	3.1	----	----	----	----	2.4	7,822	14,080	----	22	----
			2	----	18.0	73.5	8.5	3.2	----	----	----	----	----	8,050	14,490	----	----	----
White; Mooween mine, Upper Freeport bed (700 feet southwest of mine mouth).	4,336	A	1	2.2	30.9	59.7	7.2	1.4	----	----	----	----	1.3	----	----	----	22	----
Same (485 feet west of mine mouth)	4,337	A	1	2.2	31.0	58.4	8.4	1.5	----	----	----	----	1.3	7,667	13,800	----	22	----
			2	----	31.7	59.7	8.6	1.6	----	----	----	----	----	7,839	14,110	----	----	----
White Station (Mooween); Watson No. 1 and 2 mine, Upper Freeport bed (face of A main entry, 3,000 feet northwest of mine mouth) No. 1 mine	85,652	B	1	2.4	30.0	58.3	9.3	.9	----	----	----	----	1.4	7,528	13,550	2,190	----	211
Same (face of 15 room, C-5 heading, 5,000 feet northwest of mine mouth) No. 1 mine	85,653	B	1	2.5	31.3	60.3	5.9	.8	----	----	----	----	1.5	7,822	14,070	2,450	----	----
Same (face of 16 room, C-4 heading, 5,000 feet northwest of mine mouth, No. 1 mine).	85,654	B	1	2.1	32.3	59.2	6.4	.7	----	----	----	----	1.3	7,800	14,010	2,390	----	----
Same (face of straight main heading, 8,000 feet north of mine mouth, No. 2 mine).	85,655	B	1	2.4	32.0	59.2	6.4	1.1	----	----	----	----	1.6	7,767	13,980	2,450	----	----
Same (composite of samples 85,652 to 85,655 inclusive).	85,656	B	1	2.3	31.2	59.6	6.9	.9	5.1	78.1	1.5	7.5	1.4	7,722	13,900	----	----	----
			2	----	31.9	61.0	7.1	.9	4.9	80.0	1.5	5.6	----	7,966	14,230	----	----	----
			3	----	34.3	65.7	----	1.0	5.3	86.1	1.6	6.0	----	8,506	15,310	----	----	----
JEFFERSON COUNTY.																		
Brockwayville, 1 mile west of; West Clarion mine, Lower Freeport bed (face of 8 drift, 2 right entry, 800 feet from mine mouth).	17,448	B	1	1.9	34.6	53.2	10.3	2.9	5.0	72.7	1.5	7.6	1.2	7,306	13,150	2,140	123	----
			2	----	35.3	54.2	10.5	3.0	4.9	74.1	1.5	6.0	----	7,444	13,400	----	----	----
			3	----	39.4	60.9	----	3.3	5.5	82.8	1.7	6.7	----	8,317	14,970	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
JEFFERSON COUNTY—Continued.																		
Same Upper Freeport bed (face of 2 room, 14 drift, main entry).	17,449	B	1	3.1	32.3	54.9	9.7	1.7	5.0	73.7	1.6	8.3	1.2	7,344	13,220	2,300	123	-----
			2	-----	33.3	56.7	10.0	1.7	4.8	76.1	1.7	5.7	-----	7,578	13,640	-----	-----	-----
			3	-----	37.0	63.0	-----	1.9	5.3	84.5	1.8	6.5	-----	8,417	15,150	-----	-----	-----
Same Lower Kittanning bed (1 face drift, 3 right entry 4,000 feet from mine mouth).	17,450	B	1	1.9	34.5	53.2	10.4	3.4	5.0	74.1	1.5	5.6	.5	7,383	13,290	2,120	123	-----
			2	-----	35.2	54.2	10.6	3.5	4.9	75.5	1.5	4.0	-----	7,523	13,550	-----	-----	-----
			3	-----	39.3	60.7	-----	3.9	5.5	84.5	1.7	4.4	-----	8,422	15,160	-----	-----	-----
1⅝ miles south of; Groves No. 1 mine, Lower Freeport bed (face of 2 north heading)	82,574	B	1	2.6	34.8	55.1	7.5	3.0	-----	-----	-----	-----	1.7	7,556	13,600	2,240	-----	211
Same (face of 31 room, 1 left heading).	82,575	B	1	2.6	33.1	57.0	7.3	2.6	-----	-----	-----	-----	1.7	7,617	13,710	2,280	-----	-----
Same (left rib of 1 room, 30 feet from 2 south heading).	82,576	B	1	2.6	36.4	53.8	7.2	2.8	-----	-----	-----	-----	1.6	7,639	13,750	2,180	-----	-----
Same (composite of samples 82,574 to 82,576 inclusive).	82,577	B	1	2.5	34.2	56.1	7.2	2.9	5.3	75.8	1.5	7.3	1.7	7,611	13,700	-----	-----	-----
			2	-----	35.1	57.5	7.4	2.9	5.2	77.7	1.5	5.3	-----	7,806	14,050	-----	-----	-----
			3	-----	37.9	62.1	-----	3.2	5.6	83.9	1.7	5.6	-----	8,433	15,180	-----	-----	-----
Groves No. 2 mine, Upper Freeport bed (face of 2 left heading)	82,578	B	1	4.3	32.9	55.9	6.9	1.3	-----	-----	-----	-----	3.1	7,500	13,500	2,300	-----	212
Same (right rib, 200 feet from face of north heading)	82,579	B	1	3.8	32.6	55.2	8.4	1.2	-----	-----	-----	-----	2.6	7,389	13,300	2,450	-----	-----
Same (left rib, 1 left heading, 300 feet from main north heading).	82,580	B	1	3.4	33.6	55.8	7.2	1.2	-----	-----	-----	-----	2.2	7,567	13,620	2,390	-----	-----
Same (composite of samples 82,578 to 82,580 inclusive).	82,581	B	1	3.8	32.4	56.3	7.5	1.2	5.4	75.3	1.4	9.2	2.6	7,489	13,480	-----	-----	-----
			2	-----	33.7	58.5	7.8	1.3	5.2	78.2	1.4	6.1	-----	7,784	14,010	-----	-----	-----
			3	-----	36.6	63.4	-----	1.4	5.6	84.9	1.6	6.5	-----	8,445	15,200	-----	-----	-----
Brookville, 4 miles north of; Mineweaser country bank, Brookville bed (face of main heading).	82,788	B	1	2.3	35.4	52.6	9.7	3.0	-----	-----	-----	-----	1.7	7,322	13,180	2,300	-----	212
Same (right rib, 8 room, 20 feet from face, 2 left heading).	82,789	B	1	2.8	34.9	53.2	9.1	2.9	-----	-----	-----	-----	2.1	7,356	13,240	2,340	-----	-----
Same (composite of samples 82,788 and 82,789).	82,790	B	1	2.6	34.9	53.2	9.3	3.0	5.3	73.2	1.2	8.0	1.9	7,328	13,190	-----	-----	-----
			2	-----	35.9	54.6	9.5	3.1	5.1	75.2	1.3	5.8	-----	7,528	13,550	-----	-----	-----
			3	-----	39.6	60.4	-----	3.4	5.7	83.1	1.4	6.4	-----	8,311	14,960	-----	-----	-----
Coal Glen; Jefferson No. 8 mine, Lower Freeport bed (face of 3 right heading, 1 left main heading)	82,590	B	1	2.9	34.0	54.8	8.3	2.9	-----	-----	-----	-----	2.0	7,528	13,550	2,290	-----	213

Same (face of main straight heading)	82,591	B	1	3.4	34.6	54.2	7.8	2.5	----	----	----	----	2.5	7,544	13,580	2,240	----	----
Same (face of 6 left heading, main straight heading)	82,592	B	1	2.7	33.1	55.1	9.1	3.0	----	----	----	----	1.9	7,472	13,450	2,240	----	----
Same (composite of samples 82,590 to 82,592 inclusive)	82,593	B	1	3.0	33.8	54.7	8.5	2.8	5.4	74.6	1.4	7.3	2.1	7,517	13,530	----	----	----
			2	----	34.9	56.3	8.8	2.9	5.2	77.0	1.4	4.7	----	7,756	13,960	----	----	----
			3	----	38.2	61.8	----	3.1	5.7	84.4	1.6	5.2	----	8,500	15,300	----	----	----
Conifer; Conifer mine, Brookville bed (face of 7 right heading, ½ mile from mine mouth)	34,910	B	1	2.9	34.3	52.6	10.2	5.0	----	----	----	----	1.6	7,306	13,150	2,160	----	213
Same (face of 4 left heading, ½ mile from mine mouth)	34,911	B	1	2.6	34.2	53.5	9.7	3.9	----	----	----	----	1.3	7,361	13,250	2,220	----	----
Same (composite of samples 34,910 and 34,911)	34,912	B	1	2.8	34.0	53.2	10.0	4.4	5.1	72.6	1.1	6.8	1.5	7,317	13,170	----	----	----
			2	----	35.0	54.7	10.3	4.5	4.9	74.7	1.1	4.5	----	7,528	13,550	----	----	----
			3	----	39.0	61.0	----	5.0	5.5	83.3	1.3	4.9	----	8,389	15,100	----	----	----
Dora; Dora Coal Co. mine, Lower Kittanning bed (right rib, 20 ft. from face, 1 right heading, main heading)	81,572	B	1	3.1	33.2	57.4	6.3	1.1	----	----	----	----	1.5	7,689	13,840	2,570	----	213
Same (left rib, 1 room, 10 feet from face, 3 right heading)	81,573	B	1	2.9	32.5	57.1	7.5	1.2	----	----	----	----	1.3	7,589	13,660	2,450	----	----
Same (composite of samples 81,572 and 81,573)	81,574	B	1	2.9	33.2	57.0	6.9	1.2	5.3	77.0	1.4	8.2	1.4	7,622	13,720	----	----	----
			2	----	34.2	58.7	7.1	1.2	5.2	79.3	1.5	5.7	----	7,856	14,140	----	----	----
			3	----	36.9	63.1	----	1.3	5.6	85.4	1.6	6.1	----	8,456	15,220	----	----	----
Frostburg, 1 mile west of; Dennison mine, Upper Freeport bed (right rib, 1 room, 40 feet from face, 2 right heading)	81,505	B	1	2.2	30.4	56.0	11.4	4.2	----	----	----	----	1.3	7,307	13,260	2,280	----	214
Same (left rib, 1 room, 30 feet from face, off side track, main heading)	81,506	B	1	2.5	32.9	59.9	4.7	2.0	----	----	----	----	1.4	7,872	14,170	2,200	----	----
Same (right rib, 1 room, 30 feet from face of 1 left heading)	81,507	B	1	3.0	33.3	58.5	5.2	1.4	----	----	----	----	1.5	7,822	14,080	2,340	----	----
Same (composite of samples 81,505 to 81,507 inclusive)	81,508	B	1	2.7	32.3	57.7	7.3	2.6	5.2	76.9	1.5	6.5	1.4	7,683	13,830	----	----	----
			2	----	33.2	59.3	7.5	2.7	5.1	79.0	1.5	4.2	----	7,894	14,210	----	----	----
			3	----	35.9	64.1	----	2.9	5.5	85.4	1.6	4.6	----	8,528	15,350	----	----	----
Fuller; Black Prince mine, Brookville bed (at face, ½ mile south from mine mouth)	75,736	B	1	2.7	34.7	49.6	13.0	5.7	----	----	----	----	1.5	7,056	12,700	2,130	----	214
Same (at face, ¾ mile south from mine mouth)	75,737	B	1	2.5	36.6	49.6	11.3	4.4	----	----	----	----	1.5	7,344	13,220	2,180	----	----
Same (composite of samples 75,736 and 75,737)	75,738	B	1	2.6	35.1	50.1	12.2	5.1	5.0	70.6	1.1	6.0	1.5	7,222	13,000	----	----	----
			2	----	36.0	51.4	12.6	5.2	4.8	72.5	1.2	3.7	----	7,417	13,350	----	----	----
			3	----	41.2	58.8	----	6.0	5.5	82.9	1.3	4.3	----	8,483	15,270	----	----	----
Hillman, 2 miles east of; Arthur mine, Upper Freeport bed (face of 4 south heading, ¼ mile from mine mouth)	75,815	B	1	4.1	28.6	59.1	8.2	1.7	----	----	----	----	3.2	7,406	13,330	2,510	----	215
Same (face of 3 south heading, ¼ mile from mine mouth)	75,816	B	1	3.7	29.5	58.1	8.7	1.9	----	----	----	----	2.7	7,445	13,400	2,400	----	----
Same (composite of samples 75,815 and 75,816)	75,817	B	1	3.9	29.0	58.6	8.5	1.8	5.1	75.7	1.3	7.6	2.9	7,450	13,410	----	----	----
			2	----	30.2	61.0	8.8	1.9	4.9	78.7	1.4	4.3	----	7,744	13,940	----	----	----
			3	----	33.1	66.9	----	2.1	5.3	86.4	1.5	4.7	----	8,494	15,290	----	----	----
Knoxdale, 1 mile north of; Swan No. 1 mine (formerly Stewart No. 3), Lower Freeport bed (right rib, 1 room, 100 feet from face of main heading)	82,682	B	1	4.8	34.3	53.1	7.8	3.1	----	----	----	----	3.9	7,339	13,210	2,300	----	215
Same (right rib, 100 feet from face of main heading)	82,683	B	1	3.9	34.7	54.2	7.2	3.1	----	----	----	----	3.0	7,489	13,480	2,390	----	----
Same (composite of samples 82,682 and 82,683)	82,684	B	1	4.4	34.4	53.7	7.5	3.2	5.4	73.6	1.4	8.9	3.5	7,400	13,320	----	----	----
			2	----	36.0	56.2	7.8	3.3	5.2	77.0	1.5	5.2	----	7,739	13,930	----	----	----
			3	----	39.0	61.0	----	3.6	5.6	83.5	1.6	5.7	----	8,394	15,110	----	----	----
Lanes Mills; Rattlesnake mine, Lower Kittanning bed (left rib, main heading, 600 feet from mine mouth)	82,586	B	1	3.0	33.0	57.9	6.1	.8	----	----	----	----	2.3	7,767	13,980	2,850	----	215
Same (left rib, 1 left heading, 800 feet from main heading)	82,587	B	1	3.6	33.7	56.5	6.2	.8	----	----	----	----	2.7	7,706	13,870	2,850	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
JEFFERSON COUNTY—Continued.																		
Same (right rib, 1 right heading, 700 feet from 1 left heading, main heading)	82,588	B	1	2.2	33.8	55.6	8.4	.9	-----	-----	-----	-----	1.3	7,656	13,780	2,850	-----	-----
Same (composite of samples 82,586 and 82,588 inclusive)	82,589	B	1	3.0	33.4	56.7	6.9	.9	5.4	77.4	1.4	8.0	2.1	7,672	13,810	-----	-----	-----
			2	-----	34.4	58.5	7.1	.9	5.2	79.8	1.4	5.6	-----	7,906	14,230	-----	-----	-----
			3	-----	37.1	62.9	-----	1.0	5.6	85.9	1.5	6.0	-----	8,511	15,320	-----	-----	-----
McGareys Station; Cherokee mine, Middle Kittanning bed (face of 2 right heading, 1,000 feet from mine mouth)	34,904	B	1	4.1	30.1	54.7	11.1	1.7	-----	-----	-----	-----	2.1	7,028	12,650	2,910	-----	216
Same (face of 3 right heading, 5 room, 1,300 feet from mine mouth)	34,905	B	1	3.6	30.3	55.5	10.6	1.4	-----	-----	-----	-----	1.4	7,128	12,830	2,970	-----	-----
Same (composite of samples 34,904 and 34,905)	34,906	B	1	3.8	30.0	55.3	10.9	1.5	5.0	71.9	1.3	9.4	1.8	7,089	12,700	-----	-----	-----
			2	-----	31.2	57.5	11.3	1.6	4.8	74.7	1.3	6.3	-----	7,367	13,260	-----	-----	-----
			3	-----	35.1	64.9	-----	1.8	5.4	84.3	1.5	7.0	-----	8,311	14,960	-----	-----	-----
Pan Coast; Pan Coast mine, Upper Kittanning bed (face of 5 left heading, 21 room, ⅝ mile north of mine mouth)	75,728	B	1	3.3	31.3	56.1	9.3	3.0	-----	-----	-----	-----	1.9	7,361	13,250	2,240	-----	216
Same (face of 4 left heading, ⅝ mile north of mine mouth)	75,729	B	1	2.8	32.5	55.6	9.1	2.6	-----	-----	-----	-----	1.6	7,428	13,370	2,360	-----	-----
Same (composite of samples 75,728 and 75,729)	75,730	B	1	3.1	32.2	55.2	9.5	2.9	5.2	74.2	1.4	6.8	1.7	7,439	13,390	-----	-----	-----
			2	-----	33.2	57.0	9.8	3.0	5.0	76.5	1.4	4.3	-----	7,678	13,820	-----	-----	-----
			3	-----	36.8	63.2	-----	3.3	5.5	84.8	1.5	4.8	-----	8,511	15,320	-----	-----	-----
Punxsutawney, 1 mile south of; Williams Run No. 1 mine, Lower Freeport bed (face of 2 right heading, 1 left heading, 2,200 feet from mine mouth)	75,753	B	1	3.0	32.5	59.5	4.6	1.4	-----	-----	-----	-----	1.9	7,878	14,180	2,450	-----	216
Same (face of 1 right heading, 1 left heading, 2,000 feet from mine mouth)	75,754	B	1	2.8	32.5	60.1	4.6	1.1	-----	-----	-----	-----	1.6	7,900	14,220	2,440	-----	-----
Same (face of main heading, 1,500 feet from mine mouth)	75,755	B	1	2.1	32.7	59.5	5.7	1.1	-----	-----	-----	-----	1.1	7,794	14,030	2,540	-----	-----
Same (composite of samples 75,753 to 75,755 inclusive)	75,756	B	1	2.7	32.9	59.2	5.2	1.1	5.3	79.6	1.5	7.3	1.5	7,878	14,180	-----	-----	-----
			2	-----	33.8	60.8	5.4	1.2	5.2	81.8	1.5	4.9	-----	8,094	14,570	-----	-----	-----
			3	-----	35.7	64.3	-----	1.2	5.5	86.4	1.6	5.3	-----	8,550	15,390	-----	-----	-----

3 miles north of; at Delaney; Adrian mine, Lower Freeport bed (7,300 feet northeast of mine mouth)	5,219	A	1	3.6	27.2	65.1	4.1	.8					2.4	8,039	14,470		22	
			2		28.2	67.6	4.2	.9						8,333	15,000			
Same (6,800 feet east of mine mouth)	5,221	A	1	2.8	26.4	66.4	4.4	.9					1.5	8,061	14,510		22	
			2		27.2	68.3	4.5	1.0						8,289	14,920			
4 miles north of; Florence mine, Lower Freeport bed (7,920 feet east of mine mouth)	5,231	A	1	2.5	27.8	64.0	5.7	1.2					1.1	7,944	14,300		22	
			2		28.5	65.6	5.9	1.2						8,150	14,670			
Same (7,920 feet southeast of mine mouth)	5,232	A	1	3.2	26.3	66.3	4.2	.6					1.9	8,056	14,500		22	
			2		27.2	68.5	4.3	.7						8,317	14,970			
8¾ miles north of; Eleanora mine, Lower Freeport (bed (face of 12 left entry, 1,000 feet in by main slope entry)	26,827	A	1	3.0	30.0	60.8	6.2	1.4					2.3	7,767	13,980	2,490	193	
Same (face of 8 west entry, 4 face entry)	26,828	A	1	2.4	30.5	57.8	9.3	2.9					1.8	7,589	13,660	2,210	193	
Same (face of 2 room, 4 west butt entry, 14 west entry)	26,829	A	1	2.2	30.7	59.0	8.1	1.8					1.8	7,711	13,880	2,430	193	
Same (face of 2 west butt entry, 14 left entry)	26,830	A	1	2.8	29.0	60.9	7.3	1.7					2.2	7,717	13,890	2,390	193	
Same (face of 1 left entry, 12 south entry)	26,831	A	1	2.6	29.8	59.5	8.1	2.2					2.0	7,689	13,840	2,120	193	
Same (composite of samples 26,827 to 26,831 inclusive)	26,832	A	1	2.6	30.4	59.1	7.9	2.0	5.1	76.6	1.2	7.2	2.0	7,700	13,860		193	
			2		31.2	60.6	8.2	2.1	4.9	78.7	1.3	4.8		7,906	14,230			
			3		34.0	66.0		2.2	5.3	85.7	1.4	5.4		8,606	15,490			
Ramsaytown, 2 miles west of; Shawmut No. 4 mine, Lower Freeport bed (face of 6 right heading, ¾ from mine mouth)	34,986	B	1	2.7	35.4	50.8	11.1	3.2					1.5	7,167	12,900	2,190		217
Same (face of 5 left heading, ¾ mile from mine mouth)	34,987	B	1	2.0	34.8	51.9	11.3	3.5					.8	7,306	13,150	2,190		
Same (composite of samples 34,986 and 34,987)	34,988	B	1	2.4	34.9	51.6	11.1	3.4	5.1	72.6	1.4	6.4	1.1	7,261	13,070			
			2		35.7	52.9	11.4	3.5	4.9	74.4	1.5	4.3		7,444	13,400			
			3		40.3	59.7		4.0	5.6	84.0	1.7	4.7		8,400	15,120			
Stanton Station, 1¼ miles from; Hunter & Galbraith mine, Upper Freeport bed (face of 2 room, 500 feet from mine mouth)	34,907	B	1	3.1	34.2	53.0	9.7	2.9					1.6	7,378	13,280			217
Same (face of 3 room, 500 feet from mine mouth)	34,908	B	1	10.4	31.7	49.1	8.8	2.5					9.1	6,806	12,250			
Same (composite of samples 34,907 and 34,908)	34,909	B	1	6.7	33.7	50.3	9.3	2.6	5.5	70.8	1.4	10.4	5.3	7,111	12,800			
			2		36.1	54.0	9.9	2.8	5.1	75.8	1.5	4.9		7,622	13,720			
			3		40.0	60.0		3.1	5.7	84.2	1.6	5.4		8,461	15,230			
Summerville, ¼ mile south of; Pennsy No. 6 mine, Lower Kittanning bed (face of 9 right butt heading)	82,804	B	1	2.5	36.8	48.3	12.4	2.9					1.3	7,122	12,820	2,390		217
Same (face of 3 face heading)	82,805	B	1	2.6	34.6	48.7	14.1	3.2					1.6	6,967	12,540	2,390		
Same (face of 6 right butt heading)	82,806	B	1	3.3	36.4	51.0	9.3	3.0					2.3	7,328	13,190	2,280		
Same (composite of samples 82,804 to 82,806 inclusive)	82,807	B	1	2.8	35.8	49.7	11.7	3.1	5.3	71.0	1.4	7.5	1.7	7,133	12,840			
			2		36.8	51.1	12.1	3.2	5.1	73.0	1.4	5.2		7,339	13,210			
			3		41.9	58.1		3.6	5.8	83.0	1.6	6.0		8,344	15,020			
¼ mile south of; Pennsy No. 10 mine, Brookville bed (face of 7 room, 19 right heading)	82,808	B	1	2.6	34.7	53.0	9.7	3.2					1.7	7,322	13,180	2,390		218
Same (face of 9 room, 18 right heading)	82,809	B	1	2.5	35.5	53.1	8.9	2.6					1.9	7,433	13,380	2,450		
Same (face of main heading)	82,810	B	1	2.5	36.3	50.1	11.1	3.9					1.7	7,200	12,960	2,390		
Same (composite of samples 82,808 to 82,810 inclusive)	82,811	B	1	2.5	35.5	52.2	9.8	3.2	5.2	73.5	1.2	7.1	1.7	7,317	13,170			
			2		36.4	53.5	10.1	3.3	5.0	75.4	1.2	5.0		7,506	13,510			
			3		40.5	59.5		3.7	5.6	83.9	1.4	5.4		8,344	15,020			
Sikesville, 1 mile south of; Sikesville mine, Lower Freeport bed (pillar at last cut-through, between 8 left main and back heading, main south heading)	12,455	A	1	2.4	28.4	60.8	8.4	1.3	5.1	76.9	1.3	7.0	1.6	7,628	13,730	2,720	85	
			2		29.2	62.1	8.7	1.4	4.9	78.8	1.3	4.9		7,822	14,080			
			3		31.9	68.1		1.5	5.4	86.3	1.5	5.3		8,561	15,410			
Same (from cavity in roof, between 3 right butt heading and 2 back heading, 8 main, main south heading)	12,457	A	1	2.1	28.4	53.5	16.0	4.0	4.7	68.9	1.2	5.2	1.3	6,889	12,400	2,330	85	
			2		29.0	54.7	16.3	4.1	4.5	70.3	1.2	3.6		7,033	12,660			
			3		34.7	65.3		4.9	5.4	84.0	1.4	4.3		8,406	15,130			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample: Laboratory No.*	Sample: Kind.†	Sample: Condition.‡	Proximate: Moisture.	Proximate: Volatile matter.	Proximate: bon.	Proximate: Ash.	Ultimate: Sulphur.	Ultimate: Hydrogen.	Ultimate: Carbon.	Ultimate: Nitrogen.	Ultimate: Oxygen.	Air-drying loss.	Calorific value: Calories.	Calorific value: British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
JEFFERSON COUNTY—Continued.																		
Same (face of 3 right butt heading, 8 left, main south heading)	12,458	A	1	2.5	29.5	60.5	7.5	1.3	5.1	78.1	1.4	6.6	1.5	7,683	13,830	2,560	85	-----
			2	-----	30.3	62.0	7.7	1.3	4.9	80.1	1.4	4.6	-----	7,883	14,190	-----	-----	-----
			3	1.9	29.0	51.4	17.7	2.3	4.5	67.8	1.2	6.5	1.2	6,722	12,100	2,410	85	-----
Same (cavity in roof of 3 right butt heading, 8 left main, about 200 feet from face of main heading)	12,471	A	1	-----	32.8	67.2	-----	1.5	5.3	86.8	1.5	4.9	-----	8,539	15,370	-----	-----	-----
			2	-----	29.6	52.4	18.0	2.3	4.4	69.1	1.2	5.0	-----	6,856	12,340	-----	-----	-----
			3	-----	36.1	63.9	-----	2.8	5.4	84.4	1.4	6.0	-----	8,361	15,050	-----	-----	-----
Timbin, ½ mile southeast of; Mill No. 2 mine, Upper Freeport bed (right rib, 15 feet from face of 1 left heading)	81,568	B	1	2.7	34.0	55.4	7.9	2.1	-----	-----	-----	-----	1.2	7,561	13,610	2,540	-----	218
Same (face of Snuff heading)	81,569	B	1	2.3	35.6	53.3	8.8	2.7	-----	-----	-----	-----	1.0	7,528	13,550	2,240	-----	-----
Same (right rib, 20 feet from face of Gilbert heading)	81,570	B	1	2.5	35.5	53.6	8.4	2.8	-----	-----	-----	-----	1.1	7,533	13,560	2,070	-----	-----
Same (composite of samples 81,568 to 81,570 inclusive	81,571	B	1	2.7	34.8	54.2	8.3	2.5	5.2	74.4	1.4	8.2	1.1	7,528	13,550	-----	-----	-----
			2	-----	35.8	55.7	8.5	2.6	5.0	76.4	1.4	6.1	-----	7,733	13,920	-----	-----	-----
			3	-----	39.1	60.9	-----	2.9	5.5	83.5	1.6	6.5	-----	8,450	15,210	-----	-----	-----
Valier; Light No. 1 mine, Lower Freeport bed (left rib, 50 feet from face of main heading)	81,501	B	1	2.4	28.9	55.9	12.8	3.6	-----	-----	-----	-----	1.6	7,239	13,030	2,240	-----	219
Same left rib, 10 feet from face of shaft, heading)	81,502	B	1	3.5	31.1	53.2	12.2	4.1	-----	-----	-----	-----	2.7	7,211	12,980	2,280	-----	-----
Same (left rib, 75 feet from face of 4 main heading)	81,503	B	1	2.9	33.3	57.7	6.1	2.2	-----	-----	-----	-----	1.8	7,722	13,900	2,280	-----	-----
Same (composite of samples 81,501 to 81,503 inclusive)	81,504	B	1	3.0	31.0	55.6	10.4	3.2	5.0	73.6	1.4	6.4	2.0	7,386	13,300	-----	-----	-----
			2	-----	32.0	57.3	10.7	3.3	4.8	75.8	1.4	4.0	-----	7,611	13,700	-----	-----	-----
			3	-----	35.8	64.2	-----	3.7	5.4	84.9	1.6	4.4	-----	8,522	15,340	-----	-----	-----
Wishaw (Trout Run); Trout Run No. 3 mine, Lower Freeport bed (face of 2 room, 1 parallel heading, 5 right heading)	82,653	B	1	2.4	38.8	57.0	5.8	1.8	-----	-----	-----	-----	1.6	7,822	14,080	2,340	-----	219
Same (face of 2 parallel heading stump, 5 right heading, Dumer east line heading)	82,654	B	1	2.4	34.2	57.8	5.6	1.0	-----	-----	-----	-----	1.7	7,817	14,070	2,740	-----	-----
Same (face of 4 room, 7 right heading)	82,655	B	1	2.4	34.2	58.9	4.5	1.0	-----	-----	-----	-----	1.5	7,994	14,390	2,850	-----	-----
Same (composite of samples 82,653 to 82,655 inclusive	82,656	B	1	2.5	34.4	57.8	5.3	1.3	5.4	79.0	1.4	7.6	1.6	7,828	14,090	-----	-----	-----
			2	-----	35.2	59.3	5.5	1.4	5.2	81.1	1.5	5.3	-----	8,028	14,450	-----	-----	-----
			3	-----	37.3	62.7	-----	1.5	5.5	85.8	1.6	5.6	-----	8,495	15,290	-----	-----	-----

LAWRENCE COUNTY.																	
Wampum Station, 2 miles west of, Crescent mine, Middle Kittanning bed (face of main entry, 4,200 feet from mine mouth)	34,739	B	1	7.8	34.3	48.5	9.4	5.4					6.5	6,833	12,300	2,410		220
Same (face of entry, 15 left room, 3,900 feet from mine mouth)	34,740	B	1	6.9	32.4	49.8	10.9	1.9					5.0	6,778	12,200	2,540		
Same (face of 9 butt entry, 1,700 feet from mine mouth)	34,741	B	1	5.7	33.4	54.3	6.6	1.9					4.1	7,244	13,040	2,410		
Same (composite of samples 34,739 to 34,741 inclusive	34,742	B	1	6.9	33.5	50.7	8.9	3.0	5.4	69.6	1.3	11.8	5.2	6,972	12,550			
			2		36.0	54.4	9.6	3.2	5.0	74.8	1.4	6.0		7,483	13,470			
			3		39.8	60.2		3.6	5.5	82.7	1.5	6.7		8,272	14,890			
2 miles southwest of; Vance country bank, 6-foot bed, (face of 2 face entry, 150 yds. from mine mouth)	34,736	B	1	3.8	38.2	51.9	6.1	2.6					2.2	7,483	13,470	2,130		220
Same (face of 4 face entry, 175 yds. from mine mouth)	34,737	B	1	3.8	38.6	52.5	5.1	2.4					2.1	7,517	13,530	2,190		
Same (composite of samples 34,736 and 34,737)	34,738	B	1	3.8	38.4	52.2	5.6	2.6	5.5	75.0	1.5	9.8	2.2	7,522	13,540			
			2		40.0	54.2	5.8	2.7	5.3	78.0	1.6	6.6		7,822	14,080			
			3		42.4	57.6		2.8	5.6	82.8	1.7	7.1		8,306	14,950			
LYCOMING COUNTY																		
Ralston, 2 miles west of; Red Run mine, Lower Kittanning bed (face of main heading, 300 yds. from mine mouth, upper bench)	75,520	B	1	5.1	15.8	64.6	14.5	.5					3.1	6,772	12,190	2,960		220
Same (face of 1 left heading, 100 feet from mine mouth, lower bench)	75,521	B	1	3.0	15.5	64.9	16.6	.6					1.9	6,811	12,260	3,000		
Same (composite of samples 75,520 and 75,521)	75,522	B	1	3.9	15.8	64.5	15.8	.5	4.1	71.4	1.0	7.2	2.5	6,756	12,160			
			2		16.4	67.2	16.4	.6	3.8	74.3	1.1	3.8		7,028	12,650			
			3		19.7	80.3		.7	4.6	88.9	1.3	4.5		8,411	15,140			
McKEAN COUNTY.																		
Clermont; Clermont mine, Lower Vein bed (rib of main heading, 700 feet from mine mouth)	34,982	B	1	3.7	33.5	43.9	18.9	4.2					2.5	6,350	11,430	2,440		221
Same (face of main heading ¼ mile from mine mouth)	34,983	B	1	2.4	33.9	44.4	19.3	5.5					1.2	6,467	11,640	2,160		
Same rib on main heading, ½ mile from mine mouth)	34,984	B	1	3.4	37.3	48.8	10.5	4.0					2.2	7,239	13,030	2,220		
Same (composite of samples 34,982 to 34,984 inclusive	34,985	B	1	3.2	34.8	45.9	16.1	4.6	5.0	65.6	1.1	7.6	2.0	6,672	12,010			
			2		36.0	47.3	16.7	4.7	4.8	67.8	1.2	4.8		6,894	12,410			
			3		43.2	56.8		5.7	5.8	81.3	1.4	5.8		8,267	14,880			
½ mile south of; Coal Blossom mine, Upper Vein bed (face of outcrop)	34,992	B	1	2.0	38.1	54.0	5.9	1.6					.4	7,678	13,820	2,620		221
Same (face of outcrop)	34,993	B	1	1.8	39.2	52.9	6.1	1.6					.2	7,711	13,880	2,600		
Same (composite of samples 34,992 and 34,993)	34,994	B	1	1.9	38.2	53.8	6.1	1.6	5.4	76.8	1.5	8.6	.3	7,717	13,890			
			2		39.0	54.8	6.2	1.6	5.3	78.3	1.5	7.1		7,861	14,150			
			3		41.5	58.5		1.7	5.7	83.4	1.6	7.6		8,378	15,080			

*, †, ‡, §, ¶, See footnoe page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MERCER COUNTY.																		
Drake: Sharon No. 5 mine, Brookville bed (face of 14 right entry, south side of mine, 1,800 feet from mine mouth)	34,807	B	1	5.4	36.4	54.2	4.0	.9					2.1	7,439	13,390	2,460		222
Same (face of 12 left entry, south side of mine, 1,200 feet from mine mouth)	34,808	B	1	5.0	37.2	54.6	3.2	.9					1.8	7,561	13,610	2,610		
Same (composite of samples 34,807 and 34,808)	34,800	B	1	5.3	36.6	54.7	3.4	.9	5.6	75.2	1.6	13.3	2.0	7,511	13,520			
			2		38.7	57.7	3.6	1.0	5.3	79.4	1.7	9.0		7,933	14,280			
			3		40.1	59.9		1.0	5.5	82.4	1.7	9.4		8,228	14,810			
Grove City, 2½ miles east of: Diamond No. 3 mine, Brookville bed (face of 13 right entry, 1 mile from mine mouth)	34,816	B	1	4.6	37.9	48.8	8.7	4.1					1.9	7,106	12,790	2,430		222
Same (face of 14 right entry, 7 right room, 1 mile from mine mouth)	34,817	B	1	4.7	37.1	49.6	8.6	4.5					2.1	7,078	12,740	2,100		
Same (composite of samples 34,816 and 34,817)	34,818	B	1	4.5	38.0	48.7	8.8	4.2	5.4	70.5	1.3	9.8	2.0	7,100	12,780			
			2		39.8	51.0	9.2	4.4	5.1	73.9	1.4	6.0		7,439	13,390			
			3		43.8	56.2		4.9	5.6	81.4	1.5	6.6		8,194	14,750			
			2	4.7	37.0	48.6	9.7	4.4	5.4	70.0	1.3	9.2	2.7	7,017	12,630	2,090		
Same (face of 17 room, left side of 13 right entry)	80,590	B	1		38.9	50.9	10.2	4.7	5.1	73.5	1.4	5.1		7,361	13,250			
			3		43.3	56.7		5.2	5.7	81.8	1.5	5.8		8,188	14,740			
Oakes Station, 1 mile from Leesburg; Pennsy mine, Brookville bed (at face ¾ mile from mine mouth)	34,804	B	1	5.6	34.6	54.8	5.0	1.1					2.0	7,450	13,410	2,130		223
Same (Brown entry, ¾ mile from mine mouth)	34,805	B	1	5.8	34.7	53.3	6.2	1.1					2.5	7,178	12,920	2,220		
Same (composite of samples 34,804 and 34,805)	34,806	B	1	5.8	34.8	53.8	5.6	1.2	5.5	73.5	1.5	12.7	2.2	7,261	13,070			
			2		37.0	57.1	5.9	1.2	5.1	78.0	1.6	8.2		7,711	[illegible]			
			3		39.3	60.7		1.3	5.4	82.9	1.7	8.7		8,194	14,750			
Pardoe, 1 mile south of; Pardoe mine, Brookville bed (face of Reiser entry, left room, ¾ mile from mine mouth)	34,813	B	1	5.8	36.8	50.3	7.1	4.1					2.5	7,067	12,720	2,290		233
Same (Reiser entry, 1 mile from mine mouth)	34,814	B	1	5.4	37.6	50.3	6 7	3.4					2.2	7,189	12,940	2,040		

Same (composite of samples 34,813 and 34,814).	34,815	B	1	5.6	36.9	50.7	6.8	3.6	5.4	71.1	1.4	11.7	2.4	7,128	12,830	-----	-----	-----
			2	-----	39.1	53.7	7.2	3.9	5.1	75.3	1.5	7.0	-----	7,556	13,600	-----	-----	-----
			3	-----	42.2	57.8	-----	4.2	5.5	81.2	1.6	7.5	-----	8,144	14,660	-----	-----	-----
Stoneboro, 2 miles southeast of; Mercer No. 7 mine, Brookville bed, Hagan entry, 5,000 feet north from mine mouth).	34,810	B	1	5.0	39.7	48.3	7.0	3.7	-----	-----	-----	-----	2.4	7,206	12,970	2,060	-----	223
Same (Fiss entry, 4,500 feet north from mine mouth)	34,811	B	1	4.8	40.5	48.8	5.9	2.5	-----	-----	-----	-----	2.0	7,317	13,170	2,150	-----	-----
Same (compoite of samples 34,810 and 34,811).	34,812	B	1	5.0	39.8	48.8	6.4	3.1	5.6	72.1	1.4	11.4	2.3	7,257	13,080	-----	-----	-----
			2	-----	40.2	51.2	6.8	3.2	5.3	76.0	1.5	7.2	-----	7,656	13,780	-----	-----	-----
			3	-----	45.0	55.0	-----	3.5	5.7	81.5	1.6	7.7	-----	8,206	14,770	-----	-----	-----
SOMERSET COUNTY.																		
Acosta, ½ mile north of; Belmont No. 1 mine, Upper Kittanning bed (face of 4 room, main heading, 1,300 feet from mine mouth).	W19,536	A	1	2.0	16.1	72.8	9.1	1.4	-----	-----	-----	-----	-----	7,778	14,000	-----	85	-----
Same (face of 5 left entry, 60 feet from main entry)	W19,537	A	1	2.2	15.7	73.4	8.7	1.3	-----	-----	-----	-----	-----	7,811	14,060	-----	85	-----
Same (face of 3 room, 1 right entry).	W19,538	A	1	2.0	15.5	72.7	9.8	1.6	-----	-----	-----	-----	-----	7,683	13,830	-----	85	-----
Same (face of 2 left entry, 250 feet from main entry)	W19,539	A	1	2.0	16.2	73.1	8.7	1.3	-----	-----	-----	-----	-----	7,828	14,090	-----	85	-----
Same (face of main heading, 1,550 feet from mine mouth, 150 feet above 3 left entry)	W19,543	A	1	1.4	16.4	73.7	8.5	1.1	-----	-----	-----	-----	-----	7,872	14,170	-----	85	-----
Same (composite of samples W19,536 to W19,539 and W19,543).	12,209	A	1	1.2	15.7	74.1	9.0	1.4	4.3	80.7	1.4	3.2	-----	7,833	14,100	-----	85	-----
			2	-----	15.8	75.1	9.1	1.4	4.2	81.7	1.4	2.2	-----	7,928	14,270	-----	-----	-----
			3	-----	17.4	82.6	-----	1.6	4.7	89.9	1.5	2.3	-----	8,717	15,690	-----	-----	-----
Bakersville, ½ mile south of; Wyand mine, 300 feet southwest of entrance).	17,689	B	1	4.2	19.8	63.9	12.1	.7	4.7	74.3	1.3	6.9	2.9	7,178	12,920	3,010	123	-----
			2	-----	20.7	66.6	12.7	.7	4.4	77.6	1.3	3.3	-----	7,489	13,480	-----	-----	-----
			3	-----	23.7	76.3	-----	.8	5.1	88.8	1.5	3.8	-----	8,572	15,430	-----	-----	-----
Berlin, 1½ miles east of; Coronet No. 3 mine, Upper Freeport bed (pillar between 2 and 3 rooms, main aircourse between 3 and 4 right entries, 1,400 feet from mine mouth).	W19,535	A	1	3.0	17.7	68.6	10.7	1.5	-----	-----	-----	-----	-----	7,467	13,440	-----	85	-----
Same (face of 8 left entry, 15 feet beyond 15 room, 2,950 feet from mine mouth).	W19,532	A	1	2.3	18.5	66.4	12.8	1.8	-----	-----	-----	-----	-----	7,406	13,350	-----	85	-----
Same (face of 6 right entry, 125 feet from main heading, 2,500 feet from mine mouth).	W19,533	A	1	2.3	18.4	68.4	10.9	1.4	-----	-----	-----	-----	-----	7,561	13,610	-----	85	-----
Same (face of 13 room, 7 left entry, 2,450 feet from mine mouth).	W19,534	A	1	2.4	18.0	68.3	11.3	1.9	-----	-----	-----	-----	-----	7,522	13,540	-----	85	-----
Same (face of 7 right entry, 50 feet beyond 8 room, 2,800 feet from mine mouth).	W19,542	A	1	2.4	19.0	67.6	11.0	1.9	-----	-----	-----	-----	-----	7,600	13,680	-----	85	-----
Same (composite of samples W19,532 to W19,534 and W19,542).	12,214	A	1	1.4	18.6	68.4	11.6	1.9	4.4	77.3	1.6	3.2	-----	7,556	13,600	-----	85	-----
			2	-----	18.8	69.5	11.7	1.9	4.3	78.4	1.7	2.0	-----	7,667	13,800	-----	-----	-----
			3	-----	21.3	78.7	-----	2.2	4.9	88.9	1.9	2.1	-----	8,689	15,640	-----	-----	-----
1½ miles northeast of; John Wills No. 2 mine, Upper Kittanning bed (face of 1 butt entry, dip heading, 700 feet from mine mouth)	W46,366	A	1	3.0	20.4	66.3	10.3	1.6	-----	-----	-----	-----	-----	7,522	13,540	-----	123	-----
Same (30 feet from face of main dip heading 750 feet from mine mouth).	W46,367	A	1	2.9	20.6	66.3	10.2	1.9	-----	-----	-----	-----	-----	7,528	13,550	-----	123	-----
Same (face of 1 left heading, main heading 800 feet from mine mouth).	W46,368	A	1	3.8	19.9	66.5	9.8	1.1	-----	-----	-----	-----	-----	7,422	13,360	-----	123	-----
Same (composite of samples W46,366 to W46,368 inclusive).	19,512	A	1	3.2	19.9	66.6	10.3	1.7	4.7	77.0	1.7	4.6	-----	7,506	13,510	-----	123	-----
			2	-----	20.6	68.7	10.7	1.7	4.4	79.6	1.8	1.8	-----	7,756	13,960	-----	-----	-----
			3	-----	23.0	77.0	-----	1.9	5.0	89.0	2.0	2.1	-----	8,683	15,630	-----	-----	-----

*, †, ‡, §, ¶, See footnote Page 17

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SOMERSET COUNTY—Continued.																		
1½ miles east of; John Wills No. 3 mine, Upper Kittanning bed (1 pillar, 7 right heading, main heading, 2,600 feet from mine mouth)	W46,369	A	1	2.7	20.9	66.8	9.6	1.2	-----	-----	-----	-----	-----	7,622	13,720	-----	123	-----
Same (pillar, 8 left heading, between 6 and 7 room, 2,500 feet from mine mouth)	W46,370	A	1	4.1	20.0	66.1	9.8	1.2	-----	-----	-----	-----	-----	7,461	13,430	-----	123	-----
Same (face of 8 room, 6 right heading, 2,600 feet from mine mouth)	W46,371	A	1	2.5	21.2	66.5	9.8	1.2	-----	-----	-----	-----	-----	7,622	13,720	-----	123	-----
Same (gangway stump, between 3 and 4 rooms, 4 right heading, 1,500 feet from mine mouth)	W46,372	A	1	4.3	20.4	65.6	9.7	1.1	-----	-----	-----	-----	-----	7,428	13,370	-----	123	-----
Same (pillar, between 3 and 4 rooms, right heading, 1,400 feet from mine mouth).	W46,373	A	1	3.4	20.8	67.5	8.3	1.3	-----	-----	-----	-----	-----	7,650	13,770	-----	123	-----
Same (composite of samples W46,369 to W46,373 inclusive).	19,513	A	1	3.4	20.6	66.5	9.5	1.3	4.6	77.3	1.7	5.6	-----	7,567	13,620	-----	123	-----
			2	-----	21.3	68.9	9.8	1.4	4.4	80.0	1.8	2.6	-----	7,833	14,100	-----	-----	-----
			3	-----	23.7	76.3	-----	1.5	4.8	88.7	2.0	3.0	-----	8,683	15,630	-----	-----	-----
1½ miles southwest of; Seibert & Brandt mine, Pine Hill bed (at face of main heading)	86,838	B	1	2.0	21.9	67.7	8.4	2.6	-----	-----	-----	-----	1.6	7,678	13,820	2,620	-----	224
			2	-----	22.3	69.1	8.6	2.7	-----	-----	-----	-----	-----	7,833	14,100	-----	-----	-----
Boswell; Orenda No. 2 mine, Upper Kittanning bed (head of 7 left flat entry, 3,400 feet from mine mouth)	6,261	A	1	4.7	15.6	73.6	6.1	.8	-----	-----	-----	-----	4.1	7,739	13,930	-----	22	-----
Same (head of 8 right flat entry, 5,000 feet from mine mouth).	6,262	A	1	3.9	15.5	73.6	7.0	.7	-----	-----	-----	-----	3.2	7,744	13,940	-----	22	-----
Same (500 feet from face of 7 right heading)-----	6,263	A	1	3.4	15.5	74.8	6.3	.7	-----	-----	-----	-----	2.6	7,867	14,160	-----	22	-----
2 miles northwest of; J. G. Berkey mine, Pittsburgh bed (200 feet from mine mouth)	17,832	B	1	3.6	20.4	67.8	8.2	.8	-----	-----	-----	-----	2.4	7,611	13,700	-----	123	-----
			2	-----	21.1	70.4	8.5	.9	-----	-----	-----	-----	-----	7,889	14,200	-----	-----	-----
Reuben Horner mine, Pittsburgh bed (50 feet from slope mouth)	17,831	B	1	11.5	20.1	55.2	13.2	.8	-----	-----	-----	-----	6.0	5,683	10,230	2,710	123	-----
			2	-----	22.7	62.3	15.0	.9	-----	-----	-----	-----	-----	6,422	11,560	-----	-----	-----
Cairnbrook; Loyal Hanna No. 6 mine, Lower Kittanning bed (face of "empty" southwest entry)	19,848	B	1	4.0	17.8	71.8	6.4	.9	-----	-----	-----	-----	3.3	7,811	14,060	3,010	123	-----
Same (face of "loaded" south entry)	19,849	B	1	2.8	17.2	73.4	6.6	.8	-----	-----	-----	-----	2.1	7,889	14,200	3,010	123	-----
Same (composite of samples 19,848 and 19,849)	19,850	B	1	3.4	17.2	72.9	6.5	.8	4.8	81.5	1.4	5.0	2.7	7,833	14,100	-----	123	-----
			2	-----	17.8	75.5	6.7	.9	4.5	84.4	1.5	2.0	-----	8,111	14,600	-----	-----	-----
			3	-----	19.0	81.0	-----	.9	4.8	90.4	1.6	2.3	-----	8,689	15,640	-----	-----	-----

⅓ mile west of; Reitz No. 2 mine, Lower Kittanning bed (face of 38 room, 10 feet from 6 left entry)	W69,678	A	1	2.3	17.9	70.5	9.3	1.0						7,628	13,730		193	
			2		18.3	72.2	9.5	1.1						7,806	14,050			
Same (face of 28 room, 10 feet from 8 right entry)	W69,591	A	1	2.6	17.2	71.2	9.0	1.5						7,628	13,730		193	
			2		17.7	73.1	9.2	1.6						7,828	14,090			
Same (face of 31 room, 150 feet from 6 right entry).	W69,592	A	1	2.2	17.5	73.1	7.2	.6						7,839	14,110		193	
			2		17.9	74.7	7.4	.7						8,017	14,430			
Same (face of main heading),	W69,593	A	1	2.8	17.8	67.5	11.9	1.9						7,350	13,230		193	
			2		18.3	69.5	12.2	1.9						7,556	13,600			
Same (face of 18 room, 15 feet from 8 right entry).	W69,594	A	1	2.8	17.3	71.6	8.3	1.6						7,766	13,870		193	
			2		17.8	73.7	8.5	1.7						7,922	14,260			
2¼ miles west of; Scalp Level No. 3 mine, Lower Kittanning bed (face of 5 room, 3 left entry)	W69,595	A	1	2.1	17.4	71.7	8.8	1.3						7,689	13,840		193	
			2		17.8	73.2	9.0	1.4						7,856	14,140			
Same (face of right main heading),	W69,596	A	1	2.4	17.3	71.5	8.8	1.0						7,667	13,800		193	
			2		17.7	73.3	9.0	1.1						7,856	14,140			
Same (face of 12 room, 30 feet from 3 right entry)	W69,597	A	1	2.3	18.1	70.3	9.3	1.4						7,617	13,710		193	
			2		18.5	72.0	9.5	1.4						7,794	14,030			
Same (face of 6 room, 4 left entry),	W69,598	A	1	2.1	18.4	70.7	8.8	1.4						7,706	13,870		193	
			2		18.8	72.2	9.0	1.4						7,872	14,170			
2⅔ miles southeast of; Hitechew or Fleegle Mine, Brookville bed (entry west of main heading, 300 feet from mine mouth).	19,851	B	1	2.9	20.9	65.9	10.3	1.4	4.5	76.8	1.1	5.9	2.0	7,406	13,330	3,010	123	
			2		21.6	67.8	10.6	1.4	4.3	79.1	1.1	3.5		7,628	13,730			
			3		24.1	75.9		1.6	4.8	88.5	1.2	3.9		8,533	15,360			
Casselman, ¼ mile west of; Marine Smokeless mine, Upper Kittanning bed (face of main heading).	81,233	B	1	2.6	20.0	66.6	10.8	1.6					1.9	7,456	13,420	2,560		224
Same (face of 2 room, 6 left heading, main head)	81,232	B	1	2.7	19.5	63.6	14.2	2.5					2.0	7,167	12,900	2,150		
Same (face of 1 room, 6 right heading, main heading).	81,234	B	1	2.5	20.6	65.9	11.0	2.4					1.9	7,494	13,490	2,390		
Same (composite of samples 81,232 to 81,234 inclusive).	81,235	B	1	2.5	20.7	64.7	12.1	2.3	4.6	75.6	1.3	4.1	1.9	7,378	13,280			
			2		21.2	66.4	12.4	2.3	4.4	77.5	1.3	2.1		7,572	13,630			
			3		24.2	75.8		2.7	5.0	88.5	1.5	2.3		8,644	15,560			
Confluence, 4⅓ miles southeast of; Limmer mine, Upper Kittanning bed (at end of back subentry, 1 main entry, 2,500 feet southeast of mine mouth).	13,631	B	1	2.8	25.9	63.1	8.2	2.4					2.2	7,717	13,890	2,190	85	
			2		26.7	64.9	8.4	2.4						7,939	14,290			
Edie, 1⅔ miles northwest of; Levi Burkey mine, Upper Freeport bed (400 feet northwest of mine mouth)	17,691	B	1	3.1	19.0	67.0	10.9	1.5	4.6	76.4	1.3	5.3	2.0	7,456	13,420	2,680	123	
			2		19.6	69.2	11.2	1.6	4.4	78.8	1.3	2.7		7,689	13,840			
			3		22.0	78.0		1.8	5.0	88.8	1.5	2.9		8,661	15,590			
Elk Lick, ⅔ mile west of; Chapman No. 3 mine, Pittsburgh bed (right rib, neck of last room, 1 right, main heading),	80,785	B	1	3.2	21.6	69.4	5.8	.9					2.5	7,894	14,210	3,010		225
Same (left rib, 20 feet from face of 1 room, main heading).	80,786	B	1	3.0	21.8	69.0	6.2	.9					2.5	7,867	14,160	3,010		
Same (composite of samples 80,785 and 80,786)	80,787	B	1	3.0	21.7	69.4	5.9	.9	5.0	81.1	1.9	5.2	2.5	7,867	14,160			
			2		22.4	71.5	6.1	.9	4.8	83.5	2.0	2.7		8,111	14,600			
			3		23.9	76.1		1.0	5.1	89.0	2.1	2.9		8,639	15,550			
Chapman No. 3 mine, Pittsburgh bed (face of 2 right entry, main entry).	W71,063	A	1	2.7	20.9	70.3	6.1	.8						7,978	14,360		193	
			2		21.5	72.2	6.3	.9						8,194	14,750			
Same (face of main heading),	W71,064	A	1	2.9	21.3	68.9	6.9	.8						7,928	14,270		193	
			2		21.9	71.0	7.1	.8						8,161	14,690			
1 mile south of; Boynton No. 9 mine, Lower Freeport bed (face of 3 right entry, main entry).	W71,065	A	1	2.9	17.3	70.1	9.7	1.3						7,633	13,740		193	
			2		17.9	72.1	10.1	1.3						7,856	14,140			
Same (face of main heading),	W71,066	A	1	3.4	16.2	68.6	11.8	1.3						7,361	13,250		193	
			2		16.8	71.0	12.2	1.4						7,622	13,720			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SOMERSET COUNTY—Continued.																		
1⅓ miles northeast of; Merchants No. 3 mine, Pittsburgh bed (face of 1 right, 3 right heading, 3,300 feet northeast of mine mouth).	6,304	A	1	3.0	19.6	70.4	7.0	.7	----	----	----	----	1.9	7,878	14,180	----	22	----
			2	----	20.2	72.5	7.3	.8	----	----	----	----	----	8,122	14,620	----	----	----
Same (pillar in 12 room, 5 right heading, 4,800 feet northeast of mine mouth).	6,305	A	1	2.6	19.8	69.9	7.7	1.7	----	----	----	----	1.6	7,889	14,200	----	22	----
			2	----	20.3	71.8	7.9	1.7	----	----	----	----	----	8,100	14,580	----	----	----
2⅓ miles east of; Boynton Smokeless mine, Upper Kittanning bed (face of main heading).	W71,067	A	1	3.7	17.2	70.0	9.1	.9	----	----	----	----	----	7,561	13,610	----	193	----
			2	----	17.8	72.7	9.5	.9	----	----	----	----	----	7,844	14,120	----	----	----
Eagle mine, Lower Freeport bed (face of room, about 600 feet east of mine mouth).	13,983	B	1	3.5	18.2	69.7	8.6	1.5	----	----	----	----	2.6	7,594	13,670	2,460	85	----
			2	----	18.9	72.2	8.9	1.6	----	----	----	----	----	7,867	14,160	----	----	----
2⅓ miles northwest of; Grassy Run No. 1 mine, "4-foot" bed (at face, 1,200 feet southwest of mine mouth).	13,664	B	1	2.7	19.6	65.0	12.7	2.3	----	----	----	----	2.2	7,356	13,240	2,420	85	----
			2	----	20.2	66.8	13.0	2.4	----	----	----	----	----	7,567	13,620	----	----	----
Garrett, 1⅓ miles north of; Garrett Slope mine. Upper Kittanning bed (left rib, 8 room, aircourse, main heading).	80,885	B	1	2.7	17.9	68.7	10.7	3.0	----	----	----	----	2.3	7,389	13,300	2,340	----	225
Same (face of main slope heading)	80,886	B	1	4.1	17.3	67.0	11.6	3.0	----	----	----	----	3.7	7,228	13,010	2,510	----	----
Same (right rib of 6 room, sump heading, main heading	80,887	B	1	2.8	17.6	70.9	8.7	1.5	----	----	----	----	2.4	7,628	13,730	2,800	----	----
Same (composite of samples 80,885 to 80,887 inclusive).	80,888	B	1	3.2	17.6	68.9	10.3	2.6	4.4	77.4	1.2	4.1	2.8	7,422	13,360	----	----	----
				----	18.2	71.2	10.6	2.6	4.2	80.0	1.2	1.4	----	7,672	13,810	----	----	----
			3	----	20.4	79.6	----	2.9	4.7	89.4	1.4	1.6	----	8,578	15,470	----	----	----
McAllen mine, Lower Freeport bed (face of 1 butt heading, 2 flat heading)	80,882	B	1	2.3	19.0	68.3	10.4	1.2	----	----	----	----	1.6	7,528	13,550	2,800	----	226
Same (on left rib, 20 feet from face of 1 flat heading)	80,883	B	1	3.1	19.2	65.7	12.0	.9	----	----	----	----	2.0	7,311	13,160	2,850	----	----
Same (composite of samples 80,882 and 80,883).	80,884	B	1	2.7	19.0	67.0	11.3	1.1	4.6	76.8	1.4	4.8	2.2	7,411	13,340	----	----	----
			2	----	19.6	68.8	11.6	1.1	4.4	78.9	1.4	2.6	----	7,617	13,710	----	----	----
			3	----	22.1	77.9	----	1.2	5.0	89.2	1.6	3.0	----	8,617	15,510	----	----	----
5 miles northwest of; Atlantic Coal Co., No. 2 mine, Brookville bed (right rib, 17 left entry, 200 feet from main entry)	80,995	B	1	8.8	17.4	66.1	7.7	.7	----	----	----	----	7.9	7,111	12,800	3,000	----	226
Same (left rib, 16 left entry, 100 feet from main entry)	80,996	B	1	4.1	18.0	69.2	8.7	1.2	----	----	----	----	3.2	7,428	13,370	3,000	----	----
Same (right rib, 3 left entry, 400 feet from main entry)	80,997	B	1	4.0	19.8	68.3	7.9	.8	----	----	----	----	3.2	7,580	13,660	3,000	----	----

Same (composite of samples 80,995 to 80,997 inclusive).	80,998	B	1	5.7	18.9	67.3	8.1	.9	4.8	76.3	1.3	8.6	4.8	7,350	13,230		
			2		20.0	71.5	8.5	.9	4.4	80.9	1.4	3.9		7,794	14,030		
			3		21.9	78.1		1.0	4.8	88.5	1.5	4.2		8,517	15,330		
Gillette, 1¾ miles southwest of; Jake Miller mine, (500 feet northeast of mine mouth).	17,692	B	1	2.9	21.7	64.5	10.9	1.2	4.7	76.6	1.4	5.2	2.1	7,478	13,460	2,510	123	
			2		22.3	66.4	11.3	1.2	4.5	78.9	1.4	2.7		7,700	13,860		
			3		25.2	74.8		1.3	5.1	88.9	1.6	3.1		8,678	15,620		
Holsopple, ½ mile north of; Lenore mine, Lower Kittanning bed (rib of 1 right entry, 200 feet from main entry).	15,078	A	1	2.8	16.0	74.0	7.2	2.2					2.0	7,761	13,970	2,260	85	
Same (face of 3 south entry),	15,079	A	1	2.3	16.7	73.0	8.0	2.6					1.9	7,794	14,030	2,290	85	
Same (30 feet from face of main entry),	15,080	A	1	1.9	17.1	72.4	8.6	2.6					1.5	7,761	13,970	2,210	85	
Same (30 feet from face of 7 south entry)	15,081	A	1	1.8	17.4	73.1	7.7	2.2					1.4	7,900	14,220	2,600	85	
Same (composite of samples 15,079 to 15,081 inclusive).	15,082	A	1	2.0	16.6	73.2	8.2	2.5	4.4	80.2	1.3	3.4	1.6	7,839	14,110		85	
			2		16.9	74.8	8.3	2.5	4.2	81.9	1.3	1.8		8,000	14,400		
			3		18.5	81.5		2.7	4.6	89.3	1.4	2.0		8,722	15,700		
Oneida mine, Upper Kittanning bed (on pillar in 6 room, 5 left entry).	15,073	A	1	2.2	15.6	72.9	9.3	1.9					1.7	7,644	13,760	2,370	85	
Same (face of 3 room, 6 left entry),	15,074	A	1	2.0	17.7	69.6	10.7	2.9					1.5	7,539	13,570	2,160	85	
Same (15 feet from face of 5 left entry),	15,075	A	1	2.3	16.7	69.6	11.5	3.5					1.8	7,417	13,350	2,120	85	
Same (face of 23 room, 3 left entry),	15,076	A	1	1.9	17.3	68.9	11.9	2.8					1.4	7,428	13,370	2,460	85	
Same (composite of samples 15,074 to 15,076 inclusive).	15,077	A	1	2.0	17.3	69.3	11.4	3.0	4.2	76.8	1.3	3.3	1.6	7,483	13,470		85	
			2		17.6	70.8	11.6	3.1	4.0	78.4	1.3	1.6		7,639	13,750		
			3		20.0	80.0		3.5	4.6	88.7	1.5	1.7		8,639	15,550		
¾ mile northeast of; Haws No. 3 mine, Lower Kittanning bed (face of 3 right entry, 7 south entry, 2,900 feet southwest of shaft).	22,541	A	1	2.6	16.2	73.4	7.8	2.5					2.0	7,856	14,140	2,390	123	
Same (face of 4 right entry, 7 south entry, 3,000 feet southwest of shaft).	22,542	A	1	2.7	16.4	73.7	7.2	2.0					2.1	7,900	14,220	2,440	123	
Same (face of 6 south entry, 2,900 feet southwest of shaft).	22,543	A	1	2.5	15.8	73.4	8.3	2.4					1.9	7,789	14,020	2,180	123	
Same (15 room, 1 right entry, 7 south entry, 50 feet up on left rib, 2,900 feet southwest of mine mouth).	22,544	A	1	2.5	16.4	73.4	7.7	2.2					1.9	7,861	14,150	2,430	123	
Same (face of main left aircourse, 3,400 feet southwest of shaft).	22,545	A	1	2.5	17.4	72.0	8.1	2.8					1.9	7,822	14,080	2,390	123	
Same (composite of samples 22,541 to 22,545 inclusive).	22,546	A	1	2.5	16.6	73.2	7.7	2.4	4.5	80.5	1.2	3.7	2.0	7,839	14,110		123	
			2		17.0	75.1	7.9	2.4	4.3	82.5	1.3	1.6		8,039	14,470		
			3		18.4	81.6		2.6	4.7	89.6	1.4	1.7		8,733	15,720		
Jenner; Jenner No. 2 mine, Upper Kittanning bed (2 face heading, 5,400 feet southwest of mine mouth)	6,264	A	1	4.0	15.7	74.0	6.3	.7					3.2	7,850	14,130		22	
			2		16.3	77.2	6.5	.7						8,178	14,720		
Same (1 face heading, 4,080 feet southwest of mine mouth).	6,265	A	1	3.1	16.2	74.7	6.0	.6					2.4	7,917	14,250		22	
			2		16.7	77.1	6.2	.6						8,172	14,710		
Same (2 butt entry, 10 heading, 3,665 feet southwest of mine mouth).	6,266	A	1	4.2	15.7	73.8	6.3	.6					3.5	7,828	14,090		22	
			2		16.4	77.0	6.6	.7						8,178	14,720		
Jerome; Jerome No. 1 mine, Upper Kittanning bed (1 west entry, main entry, 4,700 ft. west of mine mouth)	6,258	A	1	2.8	16.1	73.6	7.5	.8					2.0	7,783	14,010		22	
			2		16.6	75.7	7.7	.8						8,006	14,410		
Same (face of 9 room, 6 south entry, 2 west entry, 5,000 feet southwest of mine mouth).	6,259	A	1	2.9	16.3	74.3	6.5	.6					2.2	7,856	14,140		22	
			2		16.8	76.5	6.7	.7						8,089	14,560		
Same (face of 2 east entry, 3,900 feet southeast of mine mouth).	6,260	A	1	3.7	15.6	72.8	7.9	.8					2.9	7,672	13,810		22	
			2		16.2	75.6	8.2	.8						7,961	14,330		

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SOMERSET COUNTY—Continued.																		
Jerome No. 2 mine, Upper Kittanning bed (feet of 7 south entry, 1½ east entry)	W19,638	A	1	2.0	14.7	73.8	9.5	.9						7,650	13,770		85	
Same (face of 4 south entry, 2 east entry)	W19,639	A	1	2.1	14.5	74.1	9.3	.7						7,722	13,900		85	
Same (face of 2 east entry)	W19,642	A	1	2.7	14.3	72.2	10.8	.9						7,506	13,510		85	
Same (composite of samples W19,638, W19,639 and W19,642)	12,224	A	1	1.4	15.2	73.4	10.0	.9	4.2	79.4	1.3	4.2		7,667	13,800		85	
			2		15.4	74.5	10.1	.9	4.1	80.6	1.4	2.9		7,778	14,000			
			3		17.2	82.8		1.0	4.5	89.7	1.5	3.3		8,656	15,580			
Same (face of 1 east entry)	12,210	A	1	1.3	14.2	70.1	14.4	1.9	4.0	75.2	1.3	3.2		7,272	13,090		85	
			2		14.4	71.0	14.6	1.9	3.9	76.1	1.3	2.2		7,367	13,260			
			3		16.9	83.1		2.3	4.6	89.2	1.5	2.4		8,633	15,540			
Kimmelton; Kimmelton mine, Lower Kittanning bed (face of 8 left entry, 3,000 feet southeast of mine mouth)	2,017	A	1	3.9	14.6	73.2	8.3	1.8					3.2				22	
Same (face of 2 butt entry, 6 right entry, 3,200 feet south of mine mouth)	2,016	A	1	2.6	16.2	71.0	10.2	2.1					1.8	7,617	13,710		22	
			2		16.7	72.8	10.5	2.1						7,822	14,080			
Listie, ¼ mile north of; Stauffer No. 1 mine, Lower Freeport bed (face of 5 room, 6 right heading, 2,625 feet northwest of mine mouth)	306	A	1	2.2	17.8	72.0	8.0	.7						7,839	14,110		22	
Same (face of 4 room, 8 left heading, 2,860 feet northwest of mine mouth)	305	A	1	2.1	18.0	72.1	7.8	.6						7,900	14,220		22	
Same (face of 25 room, 6 left heading, 2,950 feet northwest of mine mouth)	307	A	1	2.2	17.5	72.2	8.1	.8						7,856	14,140		22	
Same (composite of samples 305 to 307 inclusive)	10,455	A	1	.9	17.2	73.9	8.0	.7	4.5	81.7	1.4	3.7		7,870	14,160		22	
			2		17.4	74.5	8.1	.7	4.5	82.5	1.4	2.8		8,039	14,470			
			3		18.9	81.1		.8	4.8	89.7	1.5	3.2		8,750	15,750			
Listonburg; Miller mine, Upper Kittanning bed (face of 4 left heading main heading)	81,348	B	1	1.7	28.1	58.5	11.7	4.0					1.3	7,344	13,220	2,200		227
Same (face of 7 right heading, main heading)	81,349	B	1	2.5	21.5	63.0	13.0	4.5					1.8	7,250	13,050	2,190		
Same (face main heading)	81,350	B	1	2.5	23.7	61.7	12.1	3.3					1.9	7,350	13,230	2,090		
Same (composite of samples 81,348 to 81,350 inclusive)	81,351	B	1	2.3	24.2	61.3	12.2	4.0	4.7	73.4	1.3	4.4	1.7	7,311	13,160			
			2		24.7	62.8	12.5	4.1	4.6	75.1	1.3	2.4		7,483	13,470			
			3		28.3	71.7		4.7	5.2	85.8	1.5	2.8		8,549	15,390			

MacDonaldton; Pen Mar No. 3 mine, Lower Kittanning bed (face of 3 south main heading, 6,500 feet southwest of mine mouth)	312	A	1	2.6	16.0	72.1	9.3	1.7						7,683	13,830		22	
Same (face of 13 right heading, 3 south main heading, 6,370 feet southwest of mine mouth)	313	A	1	3.0	16.1	72.0	8.9	1.6						7,689	13,840		22	
Same (face of 6 left entry, 3 south entry, 6,400 feet southeast of mine mouth)	314	A	1	2.5	16.5	71.5	9.5	1.7						7,656	13,780		22	
Same (face of 3 room, 9 right entry, 3 south main heading, 6,200 feet southwest of mine mouth)	315	A	1	2.1	16.2	70.6	11.1	2.2						7,567	13,620		22	
Same (near face of 5 right entry, 4 south main heading, 6,700 feet southwest of mine mouth)	316	A	1	2.2	17.2	70.2	10.4	2.3						7,633	13,740		22	
Same (near face of 2 right entry, 3 south main heading, 3,500 feet southwest of mine mouth)	317	A	1	2.2	15.9	71.9	10.0	2.1						7,628	13,730		22	
Same (composite of samples 312 to 317 inclusive)	10,454	A	1	1.0	16.0	72.6	10.4	2.2	4.3	79.2	1.2	2.7		7,644	13,760		22	
			2		16.2	73.3	10.5	2.2	4.2	80.0	1.3	1.8		7,833	14,100			
			3		18.1	81.9		2.5	4.7	89.4	1.4	2.0		8,711	15,680			
1½ miles southwest of; Pen Mar No. 2 mine, Lower Kittanning bed (face of 6 room, 1 level, between 1 and 2 left entries, 2,000 feet west of mine mouth)	308	A	1	3.0	15.6	72.8	8.6	1.6						7,644	13,760		22	
Same (face of 3 left entry, 2 north main heading, 2,900 feet northwest of mine mouth)	309	A	1	2.4	15.5	71.5	10.6	1.7						7,589	13,660		22	
Same (200 feet north of 8 right heading, north main heading, 3,000 feet north of mine mouth)	310	A	1	3.2	15.7	71.1	10.0	1.5						7,556	13,600		22	
Same (neck of 3 room, 1 right heading, north main heading, 1,300 feet northeast of mine mouth)	311	A	1	2.6	16.5	69.9	11.0	1.9						7,494	13,490		22	
Same (composite of samples 308 to 311 inclusive)	10,451	A	1	1.1	15.4	73.5	10.0	.9	4.3	79.1	1.3	4.4		7,572	13,630		22	
			2		15.5	74.4	10.1	.9	4.2	80.0	1.4	3.4		7,655	13,780			
			3		17.3	82.7		1.1	4.7	89.1	1.5	3.6		8,517	15,330			
Markleton, ¼ mile east of; Snyder mine, Lower Kittanning bed (face of 2 room, 4 right heading, main heading)	81,229	B	1	3.2	20.9	62.1	13.8	2.9					2.5	7,111	12,800	2,340		227
Same (face of 3 room, left heading, main heading)	81,230	B	1	2.8	20.9	63.5	12.8	2.8					2.1	7,250	13,050	2,800		
Same (composite of samples 81,229 and 81,230)	81,231	B	1	2.9	21.1	62.7	13.3	2.7	4.7	73.1	1.1	5.1	2.3	7,178	12,920			
			2		21.7	64.6	13.7	2.8	4.5	75.3	1.2	2.5		7,394	13,310			
			3		25.1	74.9		3.2	5.2	87.3	1.3	3.0		8,011	14,420			
Meyersdale; Stotler mine, Pittsburgh bed (face of 1 right main heading, 1,500 feet from mine mouth)	86,832	B	1	2.3	22.5	66.9	8.3	2.9					1.9	7,683	13,830	2,740		228
			2		23.0	68.5	8.5	3.0						7,861	14,150			
¾ mile northwest of; E. Stotler & Son mine, Pittsburgh bed (face of main heading)	80,999	B	1	3.2	21.8	65.3	9.7	1.5					2.7	7,528	13,550			228
Same (right rib, 30 feet from face, 2 right heading, main heading)	81,000	B	1	3.3	20.8	65.2	10.7	2.2					2.8	7,400	13,320	2,620		
Same (composite of samples 80,999 and 81,000)	81,001	B	1	3.4	21.2	65.1	10.3	1.8	4.8	76.0	1.7	5.4	2.7	7,444	13,400			
			2		21.9	67.4	10.7	1.8	4.6	78.7	1.8	2.4		7,688	13,840			
			3		24.5	75.5		2.1	5.2	88.1	2.0	2.6		8,604	15,490			
Same, Redstone bed (face of main heading, left neck of 2 room)	81,006	B	1	6.0	19.6	64.2	10.2	1.0					5.5	6,989	12,580	2,510		229
Same (right rib, 250 feet from main heading, 1 right heading)	81,007	B	1	5.2	20.1	63.2	11.5	.9					4.5	6,867	12,360	2,510		
Same (composite of samples 81,006 and 81,007)	81,008	B	1	5.6	20.0	63.6	10.8	.9	4.8	71.3	1.8	10.4	5.0	6,956	12,520			
			2		21.2	67.3	11.5	.9	4.4	75.6	1.9	5.7		7,372	13,270			
			3		23.9	76.1		1.0	5.0	85.4	2.1	6.5		8,328	14,990			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SOMERSET COUNTY—Continued.																		
½ mile southeast of: Engle mine, Upper Freeport bed (face of main heading, 500 feet from mine mouth)	86,837	B	1	3.5	20.7	66.6	9.2	1.8	-----	-----	-----	-----	3.1	7,567	13,620	2,960	-----	229
			2	-----	21.5	68.9	9.6	1.9	-----	-----	-----	-----	-----	7,844	14,120	-----	-----	-----
1½ miles southwest of; Elk Lick No. 1 mine, Pittsburgh bed (face of 1 room, 2 butt heading, 2 right pump heading)	6,301	A	1	2.7	19.3	71.3	6.7	.7	-----	-----	-----	-----	2.0	7,939	14,290	-----	22	-----
			2	-----	19.9	73.2	6.9	.7	-----	-----	-----	-----	-----	8,161	14,690	-----	-----	-----
Same (face of 24 room, 3 left heading, 3 right section)	6,306	A	1	2.9	19.3	69.7	8.1	.9	-----	-----	-----	-----	2.0	7,806	14,050	-----	22	-----
				-----	19.9	71.8	8.3	.9	-----	-----	-----	-----	-----	8,034	14,460	-----	-----	-----
Elk Lick No. 2 mine, Pittsburgh bed (face of 6 right heading, west main heading, 2,600 feet northwest of mine mouth)	6,302	A	1	3.0	19.5	69.5	8.0	.9	-----	-----	-----	-----	2.3	7,789	14,020	-----	22	-----
			2	-----	20.1	71.7	8.2	1.0	-----	-----	-----	-----	-----	8,028	14,450	-----	-----	-----
Elk Lick No. 2 mine, Redstone bed (extension of 2 left heading, 2,000 feet northeast of mine mouth)	6,307	A	1	3.6	19.4	66.1	10.9	1.6	-----	-----	-----	-----	2.7	7,456	13,420	-----	22	-----
			2	-----	20.2	68.4	11.4	1.6	-----	-----	-----	-----	-----	7,733	13,920	-----	-----	-----
Summit No. 1 mine, (face of 4 right heading, 4,000 feet northwest of mine mouth)	6,303	A	1	3.3	20.2	68.6	7.9	1.0	-----	-----	-----	-----	2.2	7,806	14,050	-----	22	-----
			2	-----	20.9	71.0	8.1	1.0	-----	-----	-----	-----	-----	8,072	14,530	-----	-----	-----
Summit No. 2 mine, Redstone bed (face of 2 right heading, 2,000 feet northeast of mine mouth)	6,308	A	1	2.9	18.4	66.2	12.5	1.6	-----	-----	-----	-----	2.0	7,361	13,250	-----	-----	-----
			2	-----	18.9	68.3	12.8	1.6	-----	-----	-----	-----	-----	7,584	13,650	-----	-----	-----
Same (face of 7 right heading, 3,500 feet northeast of mine mouth)	6,309	A	1	3.7	19.4	66.1	10.8	1.4	-----	-----	-----	-----	2.9	7,422	13,360	-----	22	-----
			2	-----	20.1	68.7	11.2	1.5	-----	-----	-----	-----	-----	7,706	13,870	-----	-----	-----
2½ miles southwest of; Consolidation No. 104 mine, Pittsburgh bed (20 feet from face in left rib of last room, 3 left heading, main heading)	80,852	B	1	3.1	20.4	67.3	9.2	1.1	-----	-----	-----	-----	2.7	7,606	13,690	3,010	-----	229
Same (left rib in last room in aircourse pillar, 3 left heading, main heading)	80,853	B	1	2.9	20.5	68.2	8.4	1.0	-----	-----	-----	-----	2.4	7,700	13,860	2,900	-----	-----
Same (composite of samples 80,852 and 80,853) ----	80,854	B	1	3.0	20.4	67.7	8.9	1.0	4.8	78.9	1.9	4.5	2.5	7,628	13,730	-----	-----	-----
			2	-----	21.0	69.9	9.1	1.1	4.6	81.4	1.9	1.9	-----	7,867	14,160	-----	-----	-----
			3	-----	23.1	76.9	-----	1.2	5.1	89.5	2.1	2.1	-----	8,656	15,580	-----	-----	-----
Consolidation No. 105 mine, Redstone bed (face of 40 room, 1 butt heading, east main heading)	80,855	B	1	2.5	21.7	63.6	12.2	.7	-----	-----	-----	-----	2.0	7,322	13,180	2,900	-----	230
Same (face of last room, 1 butt heading, 2 right heading)	80,856	B	1	11.0	17.8	61.4	9.8	1.3	-----	-----	-----	-----	7.7	5,944	10,700	2,820	-----	-----

Same (20 feet from face on right rib, 2 butt heading, east main heading)	80,857	B	1	3.9	20.1	63.9	12.1	2.0					3.2	7,155	12,880	2,800		
Same (left rib of chain pillar in last room, 4 left heading, main heading)	80,858	B	1	3.2	21.6	61.9	13.3	1.8					2.7	7,167	12,900	2,450		
Same (composite of samples 80,855 to 80,858 inclusive)	80,859	B	1	5.3	21.3	61.6	11.8	1.5	4.9	71.1	1.6	9.1	3.9	6,794	12,230			
			2		22.4	65.1	12.5	1.6	4.6	75.1	1.7	4.5		7,172	12,910			
			3		25.6	74.4		1.8	5.2	85.8	2.0	5.2		8,194	14,750			
3 miles northwest of; Black Coal Co. mine, Upper Freeport (?) bed right rib, main heading, 860 feet from mine mouth)	86,833	B	1	3.8	19.1	68.7	8.4	2.4					3.1	7,611	13,700	2,370		230
Same (face of main east heading, No. 2 opening)	81,076	B	1	3.5	19.8	69.6	7.1	2.5					2.8	7,744	13,940	2,220		
Same (composite of samples 81,075 and 81,076)	81,077	B	1	3.7	18.9	69.7	7.7	2.3	4.7	78.4	1.5	5.4	3.0	7,667	13,800			
			2		19.6	72.4	8.0	2.4	4.5	81.4	1.5	2.2		7,956	14,320			
			3		21.3	78.7		2.6	4.9	88.5	1.7	2.3		8,650	15,570			
3 miles south of; Pike mine, Upper Freeport bed (face of main heading, 500 feet from mine mouth)	86,833	B	1	6.3	17.9	67.9	7.9	1.0					4.9	7,356	13,240	2,570		231
			2		19.1	72.5	8.4	1.1						7,850	14,130			
6 miles south of; Meyersdale No. 3 mine, Redstone bed (face of 2 room, 2 right heading, main heading)	81,002	B	1	3.4	20.4	62.6	13.6	2.0					3.0	7,094	12,770	2,650		231
Same (face of 4 room, 2 right heading, main heading)	81,003	B	1	2.9	21.6	64.2	11.3	1.7					2.7	7,367	13,260	2,730		
Same (composite of samples 81,002 and 81,003)	81,004	B	1	3.2	21.1	63.2	12.5	1.8	4.9	73.7	1.6	5.5	2.9	7,233	13,020			
			2		21.8	65.3	12.9	1.9	4.7	76.2	1.7	2.6		7,467	13,440			
			3		25.0	75.0		2.2	5.3	87.4	1.9	3.2		8,572	15,430			
Same Pittsburgh bed (face of 3 room, main heading)	81,005	B	1	3.6	22.7	68.1	5.6	1.1	5.1	80.0	1.9	6.3	3.1	7,839	14,110	2,730		231
			2		23.5	70.7	5.8	1.2	4.8	83.0	1.9	3.3		8,128	14,630			
			3		25.0	75.0		1.3	5.1	88.1	2.1	3.4		8,633	15,540			
Pinehill, 2 miles southwest of Berlin; Consolidation No. 112 mine, Little Pittsburgh bed (face of 44 room, 8 right sub-entry, west main entry, 3,600 feet southwest of mine mouth)	13,981	B	1	2.2	21.5	67.3	9.0	2.3					1.3	7,656	13,780	2,350	85	
Same (face of 8 room, 1 right sub-entry, 12 left entry, 5,000 feet southwest of mine mouth)	13,982	B	1	3.1	21.6	68.5	6.8	1.0					1.9	7,767	13,980	2,420	85	
Same (composite of samples 13,981 and 13,982)	14,037	B	1	2.6	21.5	68.0	7.9	1.7	4.7	78.9	1.7	5.1	1.6	7,722	13,900		85	
			2		22.1	69.8	8.1	1.7	4.5	81.0	1.8	2.9		7,928	14,270			
			3		24.1	75.9		1.9	4.9	88.1	1.9	3.2		8,633	15,540			
Consolidation No. 113 mine, "Stoner" bed (from mine car, brought from 2 room, 10 right entry, 3,700 feet southwest of mine mouth)	13,984	B	1	3.4	19.1	66.7	10.8	1.9					2.7	7,400	13,320	2,470	85	
			2		19.8	69.0	11.2	2.0						7,661	13,790			
Ralphton; Ralphton No. 1 mine, Upper Kittanning bed (face of 2 west entry, 7 right entry, 4,000 feet west of mine mouth)	6,228	A	1	3.1	15.6	74.5	6.8	.5					2.1	7,878	14,180		22	
			2		16.1	76.9	7.0	.6						8,128	14,630			
Same (face of 1 dip entry, 2,300 feet south of mine mouth)	6,229	A	1	3.4	14.8	74.8	7.0	.6					2.5	7,850	14,130		22	
			2		15.3	77.5	7.2	.6						8,128	14,630			
½ mile east of; Ralphton No. 3 mine, Upper Kittanning bed (3 crosscut, 2 south entry, 3,050 feet from mine mouth)	W19,627	A	1	2.2	15.8	74.2	7.8	.6						7,850	14,130		85	
Same (face of 11 room, straight main entry, 3,150 feet from mine mouth)	W19,628	A	1	2.1	15.2	73.9	8.8	.8						7,794	14,030		85	
Same (face of 4 room, 6 right entry, 2,800 feet from mine mouth)	W19,629	A	1	1.9	16.4	73.7	8.0	.7						7,861	14,150		85	
Same (face of 29 room, 4 right heading, 2,900 from mine mouth)	W19,630	A	1	2.1	15.8	74.2	7.9	.8						7,850	14,130		85	

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SOMERSET COUNTY—Continued.																		
Same (3 crosscut, 3 south entry, 3,700 feet from mine mouth)	W19,631	A	1	2.0	15.5	73.2	9.5	.7	-----	-----	-----	-----	-----	7,772	13,990	-----	85	-----
Same (composite of samples W19,627 to W19,631 inclusive)	12,228	A	1	1.2	15.5	74.8	8.5	.7	4.4	81.1	1.5	3.8	-----	7,872	14,170	-----	85	-----
			2	-----	15.7	75.7	8.6	.7	4.3	82.2	1.5	2.8	-----	7,972	14,350	-----	-----	-----
			3	-----	17.2	82.8	-----	.8	4.7	89.9	1.6	3.0	-----	7,822	15,700	-----	-----	-----
1¼ miles north of; Ralphton No. 4 mine, Upper Kittanning bed (face of south main entry)	W19,633	A	1	2.4	15.2	74.5	7.9	.7	-----	-----	-----	-----	-----	7,822	14,080	-----	85	-----
Same (face of 7 room, south main entry)	W19,635	A	1	2.2	15.3	74.7	7.8	.6	-----	-----	-----	-----	-----	7,894	14,210	-----	85	-----
Same (face of 4 left entry) south main entry)	W19,637	A	1	2.1	14.3	75.9	7.7	.6	-----	-----	-----	-----	-----	7,900	14,220	-----	85	-----
Same (composite of samples W19,633, W19,635 and W19,637)	12,202	A	1	1.3	15.0	75.7	8.0	.7	4.3	81.6	1.4	4.0	-----	7,894	14,210	-----	85	-----
			2	-----	15.2	76.7	8.1	.7	4.2	82.7	1.4	2.9	-----	8,000	14,400	-----	-----	-----
			3	-----	16.5	83.5	-----	.7	4.6	89.9	1.5	3.3	-----	8,700	15,660	-----	-----	-----
Same (pillar between south main heading and aircourse, opposite 1 right entry)	W19,632	A	1	1.9	15.7	74.5	7.9	.7	-----	-----	-----	-----	-----	7,894	14,210	-----	85	-----
Same (pillar at second "sboo-fly", 1 main entry)	W19,636	A	1	2.6	15.2	75.1	7.1	.7	-----	-----	-----	-----	-----	7,911	14,240	-----	85	-----
Same (composite of samples W19,632 and W19,636)	12,218	A	1	1.5	15.8	74.9	7.8	.7	4.4	82.1	1.4	3.6	-----	7,939	14,290	-----	85	-----
			2	-----	16.0	76.1	7.9	.7	4.3	83.4	1.5	2.3	-----	8,056	14,500	-----	-----	-----
			3	-----	17.4	82.6	-----	.7	4.6	90.5	1.6	2.6	-----	8,750	15,750	-----	-----	-----
Rockwood, ½ mile west of; Quemahoning No. 10 mine, Upper Freeport bed (face of 3 left heading, main heading)	81,150	B	1	2.9	20.0	66.1	11.0	2.1	-----	-----	-----	-----	2.5	7,412	13,340	2,450	-----	232
Same (face of 6 left heading, main heading)	81,151	B	1	3.4	19.3	66.1	11.2	1.1	-----	-----	-----	-----	2.9	7,372	13,270	2,850	-----	-----
Same (right rib, 20 feet from face of main heading)	81,152	B	1	2.9	20.6	65.0	11.5	2.1	-----	-----	-----	-----	2.6	7,356	13,240	2,800	-----	-----
Same (composite of samples 81,150 to 81,152 inclusive)	81,153	B	1	3.2	20.4	65.2	11.2	1.7	4.7	75.2	1.3	5.9	2.7	7,372	13,270	-----	-----	-----
			2	-----	21.1	67.4	11.5	1.8	4.5	77.7	1.3	3.2	-----	7,617	13,710	-----	-----	-----
			3	-----	23.9	76.1	-----	2.0	5.1	87.8	1.5	3.6	-----	8,611	15,500	-----	-----	-----
4 miles north of; MacGregor No. 1 mine, Lower Kittanning bed (left rib, 20 feet from face of main heading)	81,154	B	1	2.5	19.9	68.7	8.9	2.2	-----	-----	-----	-----	2.2	7,639	13,750	2,510	-----	232
Same (left rib, 20 feet from face of 6 room, 2 left heading, main heading)	81,155	B	1	2.6	20.7	66.7	10.0	2.5	-----	-----	-----	-----	2.3	7,483	13,470	2,310	-----	-----

Same (composite of samples 81,154 and 81,155)	81,156	B	1	3.7	20.3	67.4	9.6	2.3	4.7	77.2	1.3	4.9	2.2	7,578	13,640	------	-----	-----
			2	-----	20.9	69.3	9.8	2.4	4.5	79.4	1.3	2.6	-----	7,7?0	14,020	------	-----	-----
			3	-----	23.2	76.8	------	2.6	5.0	88.1	1.4	2.9	-----	8,639	15,550	------	-----	-----
6 miles north of; J. M. Murdock Bros. mine, Lower Kittanning bed (left rib, 20 feet from face of main heading)	81,160	B	1	2.1	21.3	64.1	12.5	3.0	-----	------	-----	-----	1.8	7,322	13,180	2,290	-----	-----
Same (left rib, 1 room, 2 left heading, 20 feet from face).	81,161	B	1	3.4	18.9	65.2	12.5	2.7	-----	------	-----	-----	2.9	7,178	12,920	2,510	-----	-----
Same (composite of samples 81,160 and 81,161	81,162	B	1	2.7	20.1	64.7	12.5	2.8	4.5	73.6	1.2	5.4	2.4	7,256	13,060	------	-----	-----
			2	-----	20.7	66.5	12.8	2.9	4.3	75.7	1.3	3.0	-----	7,456	13,420	------	-----	-----
			3	-----	23.7	76.3	------	3.3	4.9	86.8	1.5	3.5	-----	8,550	15,390	------	-----	-----
Salisbury, 2 miles northwest of; Compton mine, Barton bed (face of entry, 500 feet from mine mouth)	86,827	B	1	3.9	19.5	67.9	8.7	2.0	-----	------	-----	-----	3.1	7,478	13,460	2,510	-----	-----
Same (face of main heading, 100 ft. from mine mouth)	86,828	B	1	3.2	19.7	71.2	5.9	2.5	-----	------	-----	-----	2.6	7,850	14,130	2,390	-----	-----
Same (on rib of main heading, 200 feet from mine mouth).	86,829	B	1	1.7	21.0	72.5	4.8	1.9	-----	------	-----	-----	1.2	8,072	14,530	2,340	-----	-----
Same (composite of samples 86,827 to 86,829 inclusive).	86,830	B	1	3.0	19.9	70.7	6.4	2.2	4.7	79.9	1.5	5.3	2.3	7,811	14,060	------	-----	-----
			2	-----	20.5	72.9	6.6	2.3	4.5	82.4	1.5	2.7	-----	8,044	14,480	------	-----	-----
			3	-----	22.0	78.0	------	2.4	4.8	88.2	1.6	3.0	-----	8,617	15,510	------	-----	-----
3 miles northwest of; Davis mine, Lower Kittanning bed (face of entry, 200 feet from mine mouth).	86,834	B	1	3.4	22.5	67.3	6.8	1.0	-----	------	-----	-----	2.8	7,767	13,980	2,570	-----	-----
			2	-----	23.3	69.7	7.0	1.0	-----	------	-----	-----	-----	8,039	14,470	------	-----	-----
Same Opal mine, Bakerstown bed (face of entry, 200 feet from mine mouth)	86,835	B	1	4.1	18.4	70.2	7.3	.8	-----	------	-----	-----	3.4	7,606	13,690	2,510	-----	-----
			2	-----	19.2	73.2	7.6	.9	-----	------	-----	-----	-----	7,933	14,280	------	-----	-----
Seanor Station, ½ mile south of; Eureka No. 39 mine, Upper Kittanning bed (face of 6 left entry, 9 left main entry)	W68,200	A	1	2.1	16.1	73.2	8.6	1.6	-----	------	-----	-----	-----	7,783	14,010	2,390	193	-----
Same (face of 11 right entry, 9 left main entry)	W68,205	A	1	3.0	17.3	71.0	8.7	2.5	-----	------	-----	-----	-----	7,656	13,780	1,980	193	-----
Same (face of 9 right entry, 9 left main entry)	W68,214	A	1	2.1	15.9	72.5	9.5	2.4	-----	------	-----	-----	-----	7,656	13,780	2,210	193	-----
Same (composite of samples W68,200, W68,205 and W68,214)	30,161	A	1	2.4	17.3	71.3	9.0	2.5	4.3	78.5	1.2	4.5	-----	7,633	13,740	------	193	-----
			2	-----	17.7	73.1	9.2	2.6	4.1	80.4	1.2	2.5	-----	7,822	14,080	------	-----	-----
			3	-----	19.5	80.5	------	2.9	4.5	88.6	1.4	2.6	-----	8,611	15,500	------	-----	-----
Somerset, ½ mile southeast of; Sanner & Shaffer mine, U. Kittanning bed (300 feet from mine mouth).	17,694	B	1	3.6	17.6	69.5	9.3	1.6	4.6	77.7	1.2	5.6	2.7	7,517	13,530	2,630	123	-----
			2	-----	18.3	72.1	9.6	1.7	4.4	80.6	1.2	2.5	-----	7,794	14,030	------	-----	-----
			3	-----	20.2	79.8	------	1.9	4.8	89.2	1.4	2.7	-----	8,622	15,520	------	-----	-----
¾ mile northeast of; Neva mine, Upper Freeport bed (400 feet from mine mouth).	17,693	B	1	2.1	21.1	65.0	11.8	2.4	4.6	76.4	1.3	3.5	1.4	7,461	13,430	2,270	123	-----
			2	-----	21.6	66.3	12.1	2.5	4.4	78.0	1.3	1.7	-----	7,617	13,710	------	-----	-----
			3	-----	24.5	75.5	------	2.8	5.0	88.7	1.5	2.0	-----	8,667	15,600	------	-----	-----
4⅓ miles southeast of; Stauffer No. 3 mine, Lower Freeport bed (face of 1 right entry, 20 feet inside 2 butt entry).	17,695	B	1	2.9	18.7	73.2	5.2	.6	4.8	82.9	1.4	5.1	1.7	7,972	14,350	3,010	123	-----
			2	-----	19.3	75.4	5.3	.7	4.6	85.4	1.5	2.5	-----	8,211	14,780	------	-----	-----
			3	-----	20.4	79.6	------	.7	4.9	90.2	1.5	2.7	-----	8,678	15,620	------	-----	-----
Stony Creek, 2 miles northeast of; Country bank, (face of outcrop).	87,002	B	1	4.3	17.6	69.4	8.7	2.4	-----	------	-----	-----	3.1	7,350	13,230	2,340	-----	-----
			2	-----	18.4	72.5	9.1	2.5	-----	------	-----	-----	-----	7,678	13,820	------	-----	-----
Stoughton; Jenner No. 1 mine, Upper Kittanning bed (face of 3 right entry, 1 dip entry, 1,300 feet northeast of mine mouth).	6,267	A	1	3.1	15.9	73.5	7.5	.7	-----	------	-----	-----	2.2	7,806	14,050	------	22	-----
			2	-----	16.4	75.8	7.8	.7	-----	------	-----	-----	-----	8,056	14,500	------	-----	-----
Same (face of 3 dip entry, 1,500 feet southwest of mine mouth).	6,270	A	1	3.0	15.7	74.0	7.3	.6	-----	------	-----	-----	2.1	7,878	14,180	------	22	-----
			2	-----	16.2	76.3	7.5	.6	-----	------	-----	-----	-----	8,118	14,610	------	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Ultimate. Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SOMERSET COUNTY—Continued.																		
Summit Mills, 2 miles northwest of; Johnson mine, Upper Freeport bed (face of main heading, 600 feet from mine mouth).	86,836	B	1	4.0	19.6	67.7	8.7	3.1	-----	-----	-----	-----	3.4	7,483	13,470	2.740	-----	-----
			2	-----	20.4	70.5	9.1	3.2	-----	-----	-----	-----	-----	7,794	14,030	-----	-----	-----
3 miles northwest of; Handiverk mine, Lower Freeport bed (face of main heading, 1,000 feet from mine mouth).	86,831	B	1	3.0	21.1	66.3	9.6	1.8	-----	-----	-----	-----	2.6	7,550	13,590	2,740	-----	-----
			2	-----	21.7	68.4	9.9	1.8	-----	-----	-----	-----	-----	7,783	14,010	-----	-----	-----
Ursina; Ursina Mill mine, Upper Kittanning bed (face of 2 right entry)	82,582	B	1	2.4	22.0	63.6	12.0	3.7	-----	-----	-----	-----	1.9	7,394	13,310	2,340	-----	-----
Same (face of room, 5 right entry).	82,583	B	1	2.8	23.6	61.4	12.2	3.4	-----	-----	-----	-----	2.3	7,333	13,200	2,390	-----	-----
Same (face of 5 left air-course)	82,584	B	1	2.1	24.2	59.2	14.5	4.0	-----	-----	-----	-----	1.6	7,172	12,910	2,310	-----	-----
Same (composite of samples 82,582 to 82,584 inclusive).	82,585	B	1	2.4	23.2	63.0	12.4	3.6	4.6	73.7	1.2	4.5	1.9	7,289	13,120	-----	-----	-----
			2	-----	23.8	63.5	12.7	3.7	4.4	75.4	1.2	2.6	-----	7,467	13,440	-----	-----	-----
			3	-----	27.2	72.8	-----	4.2	5.1	80.4	1.4	2.9	-----	8,555	15,400	-----	-----	-----
Same Upper Freeport bed (face of 4 right entry, main heading).	81,352	B	1	2.6	24.2	60.0	13.2	1.2	-----	-----	-----	-----	2.1	7,256	13,060	2,910	-----	-----
			2	-----	24.9	61.6	13.5	1.2	-----	-----	-----	-----	-----	7,450	13,410	-----	-----	-----
Windber; Eureka No. 31 mine, Lower Kittanning bed (pillar, 4 room, 7 south entry, 46 west entry, main entry).	9,004	A	1	2.5	12.5	78.5	6.5	1.5	-----	-----	-----	-----	1.8	-----	-----	-----	22	-----
Same (pillar, 13 room, 3 south entry, 46 west entry, main entry).	9,005	A	1	2.3	14.0	77.3	6.4	1.6	-----	-----	-----	-----	1.8	-----	-----	-----	22	-----
Same (13 pillar, 56 east entry, main entry).	9,006	A	1	2.5	13.5	77.0	7.0	1.3	-----	-----	-----	-----	1.7	-----	-----	-----	22	-----
Same (pillar in 4 room, 36 east entry, main entry).	9,007	A	1	2.1	14.5	78.0	5.4	.7	-----	-----	-----	-----	1.4	-----	-----	-----	22	-----
Same (composite of samples 9,004 to 9,007 inclusive).	9,021	A	1	2.4	13.5	77.8	6.3	1.3	4.4	82.6	1.3	4.1	1.7	7,985	14,370	-----	22	-----
			2	-----	13.5	80.0	6.5	1.3	4.3	84.7	1.3	1.9	-----	8,185	14,730	-----	-----	-----
			3	-----	14.5	85.5	-----	1.4	4.6	90.5	1.4	2.1	-----	8,750	15,750	-----	-----	-----
Same (face of room, 2 left entry, new drift entry)	9,008	A	1	2.3	15.0	74.3	8.4	1.6	-----	-----	-----	-----	1.7	-----	-----	-----	22	-----
Same (face of 1 room, 15 southwest entry, main entry).	9,009	A	1	2.4	13.5	78.6	5.5	.9	-----	-----	-----	-----	1.6	-----	-----	-----	22	-----
Same (composite of samples 9,008 and 9,009).	9,010	A	1	2.5	13.5	77.0	7.0	1.3	4.3	81.6	1.3	4.5	1.7	7,925	14,260	-----	22	-----
			2	-----	14.0	78.8	7.2	1.3	4.2	83.7	1.3	2.3	-----	8,130	14,630	-----	-----	-----
			3	-----	15.5	84.5	-----	1.4	4.5	90.2	1.4	2.5	-----	8,755	15,760	-----	-----	-----

Eureka No. 32 mine, Lower Kittanning bed (pillar) main entry, 8,000 feet southeast of mine mouth)	8,949	A	1	3.3	12.0	80.2	4.5	.7					2.5				22	
Same (pillar, 4 west entry, 12 right entry, main entry, 6,800 feet southeast of mine mouth).	8,950	A	1	3.3	12.0	80.6	4.1	.6					2.5				22	
Same (face of 26 right entry, 41 main entry, 12,000 feet southeast of mine mouth).	8,951	A	1	3.2	13.0	78.5	5.3	1.3					2.5				22	
Same (pillar, 6 right entry, main entry, 2,800 feet southeast of mine mouth).	8,952	A	1	2.7	13.5	78.8	5.0	.6					2.0				22	
Same (pillar, 5 left entry, 2 main entry, 3,300 feet northeast of mine mouth).	8,953	A	1	3.0	13.0	79.2	4.8	.6					2.3				22	
Same (composite of samples 8,949 to 8,953 inclusive).	9,022	A	1	3.3	13.0	79.0	4.7	.8	4.5	83.7	1.2	5.1	2.4	8,084	14,550		22	
			2		13.5	81.7	4.8	.8	4.3	86.5	1.3	2.3		8,361	15,050			
			3		14.0	86.0		.9	4.5	90.9	1.3	2.4		8,784	15,810			
Eureka No. 35 mine, Lower Kittanning bed (face of 23 right entry, north entry).	8,873	A	1	2.9	13.0	78.3	5.8	1.4					2.1				22	
Same (face of 23 right entry, main entry).	8,874	A	1	2.9	13.0	76.4	7.7	1.4					2.2				22	
Same (face of main aircourse, wet sample)	8,875	A	1	4.6	13.0	76.5	5.9	1.1					4.0				22	
Same (face of 21 left entry, main entry).	8,876	A	1	3.5	13.0	77.1	6.4	1.1					2.8				22	
Same (composite of samples 8,873 to 8,876 inclusive).	8,939	A	1	3.5	12.4	77.6	6.4	1.3	4.6	81.2	1.2	5.3	2.8	7,850	14,130		22	
			2		13.0	80.3	6.7	1.4	4.4	84.1	1.3	2.1		8,140	14,650			
			3		14.0	86.0		1.5	4.7	90.1	1.3	2.4		8,720	15,000			
Same (pillar, 11 right entry, north entry).	8,877	A	1	2.5	12.5	78.7	6.3	1.1					1.8				22	
Same (pillar, 6 room, 8 left entry, main entry).	8,878	A	1	2.5	13.5	78.4	5.6	.6					1.8				22	
Same (pillar, 33 room, 16 left entry, main entry)	8,879	A	1	2.5	13.0	77.7	6.8	1.6					1.8				22	
Same (composite of samples 8,877 to 8,879 inclusive).	8,940	A	1	2.5	12.5	78.8	6.2	1.1	4.4	82.3	1.3	4.7	1.8	7,985	14,380		22	
			2		12.5	81.2	6.3	1.1	4.2	84.3	1.4	2.7		8,190	14,740			
			3		13.5	86.5		1.2	4.5	90.0	1.5	2.8		8,740	15,740			
Eureka No. 35-C mine, Upper Kittanning bed (face of 2 right entry, main entry).	8,964	A	1	2.6	14.0	75.8	7.6	1.6					2.0				22	
Same (face of main entry)	8,965	A	1	2.8	13.5	75.9	7.8	1.5					2.2				22	
Same (face of 2 left aircourse, main entry)	8,966	A	1	2.9	12.0	77.3	7.8	1.3					2.3				22	
Same (composite of samples 8,964 to 8,966 inclusive).	9,025	A	1	3.0	12.0	77.4	7.6	1.5	4.3	79.8	1.2	5.6	2.2	7,820	14,070		22	
			2		12.5	79.7	7.8	1.6	4.1	82.3	1.2	3.0		8,060	14,510			
			3		13.5	86.5		1.7	4.5	89.3	1.3	3.2		8,740	15,730			
1½ miles west of; Eureka No. 30 mine, Lower Kittanning bed (pillar, 1 right entry, 10 right entry, 9,500 feet from mine mouth).	8,943	A	1	2.1	17.5	73.3	7.1	1.8					1.5	7,940	14,290		22	
Same (pillar, 10 left entry, main entry, 9,500 feet from mine mouth).	8,944	A	1	3.9	14.0	76.6	5.5	1.6					3.0	7,910	14,240		22	
Same (face of 13 right entry, 1 main entry, 10,000 feet from mine mouth).	8,945	A	1	2.5	17.5	72.3	7.7	2.3					1.7				22	
Same (face of 11 room, 11 left entry, 2 main entry, 10,800 feet from mine mouth).	8,946	A	1	3.5	13.5	76.1	6.9	1.9					2.8				22	
Same (face of 15 left entry, 2 main entry, 11,500 feet from mine mouth).	8,947	A	1	3.1	13.0	78.2	5.7	1.6					2.4				22	
Same (face of 15 left entry, 1 main entry, 10,500 feet from mine mouth).	8,948	A	1	3.4	17.0	70.8	8.8	1.7					2.7				22	
Same (composite of samples 8,945 to 8,948 inclusive).	9,019	A	1	3.1	15.0	74.8	7.1	1.9	4.6	80.8	1.3	4.3	2.4	7,830	14,100		22	
			2		15.5	77.2	7.3	1.9	4.4	83.4	1.4	1.6		8,080	14,550			
			3		17.0	83.0		2.1	4.7	89.9	1.5	1.8		8,720	15,690			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SOMERSET COUNTY—Continued.																		
Eureka No. 34 mine, Lower Kittanning bed (pillar, 1 south entry, 13 right entry, main entry).	8,959	A	1	3.1	14.0	75.3	7.6	1.4	-----	-----	-----	-----	2.5	7,760	13,970	-----	22	-----
Same (pillar, 19 room, 15 left entry, 2 main entry)	8,960	A	1	3.2	13.5	77.3	6.0	1.2	-----	-----	-----	-----	2.4	7,965	14,340	-----	22	-----
Same (face of 21 room, 2 left entry, main entry)	8,961	A	1	3.4	14.5	75.0	7.1	1.2	-----	-----	-----	-----	2.7	-----	-----	-----	22	-----
Same (face of main air-course).	8,962	A	1	2.7	15.0	76.1	6.2	1.0	-----	-----	-----	-----	2.2	-----	-----	-----	22	-----
Same (face of 5 south entry, 18 right entry, 1 main entry)	8,963	A	1	3.5	14.0	75.2	7.3	1.7	-----	-----	-----	-----	2.9	-----	-----	-----	22	-----
Same (composite of samples 8,961 to 8,963 inclusive).	9,024	A	1	3.2	14.0	75.9	6.9	1.3	4.5	80.6	1.2	5.5	2.6	7,855	14,140	-----	22	-----
			2	-----	14.5	78.4	7.1	1.4	4.3	83.2	1.3	2.7	-----	8,115	14,610	-----	-----	-----
			3	-----	15.5	84.5	-----	1.5	4.6	89.6	1.4	2.9	-----	8,740	15,730	-----	-----	-----
Eureka No. 36 mine, Lower Kittanning bed (face of 1 room, 21 right entry, 8,500 feet north of mine mouth).	6,274	A	1	2.8	15.7	75.0	6.5	2.1	-----	-----	-----	-----	2.1	7,900	14,220	-----	22	-----
Same (face of 14 right slant entry, 9,000 feet northeast of mine mouth).	6,275	A	1	3.3	14.8	76.2	5.7	1.7	-----	-----	-----	-----	2.6	7,950	14,310	-----	22	-----
Same (face of 19 right entry, 3 main slant entry, 8,500 feet northeast of mine mouth).	6,276	A	1	3.6	15.4	76.9	4.1	.5	-----	-----	-----	-----	3.0	8,117	14,610	-----	22	-----
Same (face of 1 main entry, 8,300 feet northeast of mine mouth).	8,920	A	1	3.6	13.5	77.5	5.4	1.3	-----	-----	-----	-----	3.0	-----	-----	-----	22	-----
Same (face of 4 north entry, 18 left entry, 1 main entry, 7,800 feet north of mine mouth).	8,921	A	1	4.0	13.0	77.5	5.5	1.4	-----	-----	-----	-----	3.4	-----	-----	-----	22	-----
Same (face of 2 main entry, 9,800 feet northeast of mine mouth).	8,925	A	1	4.4	12.5	77.5	5.6	1.5	-----	-----	-----	-----	3.9	-----	-----	-----	22	-----
Same (composite of samples 8,920, 8,921 and 8,925)	9,026	A	1	4.3	12.0	78.1	5.6	1.4	4.5	81.8	1.3	5.4	3.4	7,945	14,300	-----	22	-----
			2	-----	12.5	81.7	5.8	1.4	4.2	85.4	1.3	1.9	-----	8,300	14,940	-----	-----	-----
			3	-----	13.5	86.5	-----	1.5	4.5	90.7	1.4	1.9	-----	8,810	15,860	-----	-----	-----
Same (7 pillar, 13 right entry, 1 main entry, 5,200 feet northeast of mine mouth).	8,922	A	1	3.2	12.5	79.0	5.3	1.5	-----	-----	-----	-----	2.6	-----	-----	-----	22	-----
Same (14 pillar, 16 right entry, 2 main entry, 6,300 feet northeast of mine mouth).	8,923	A	1	3.0	14.0	78.9	4.1	.8	-----	-----	-----	-----	2.4	-----	-----	-----	22	-----
Same (20 pillar, 10 right entry, 3 main entry, 6,200 feet east of mine mouth).	8,924	A	1	3.3	13.0	79.5	4.2	.9	-----	-----	-----	-----	2.7	-----	-----	-----	22	-----

Same (composite of samples 8,922 to 8,924 inclusive)	9,027	A	1	4.2	13.0	78.3	4.5	1.0	4.5	82.6	1.3	6.1	3.4	8,060	14,500		22	
			2		13.5	81.8	4.7	1.1	4.2	86.2	1.4	2.4		8,410	15,140			
			3		14.0	86.0		1.1	4.4	90.5	1.4	2.6		8,825	15,800			
2 miles south of; Eureka No. 33 mine, Lower Kittanning bed (pillar, main entry, 6,000 feet from mine mouth)	8,954	A	1	3.3	15.5	74.8	6.4	1.0					2.6				22	
Same (pillar, 12 right entry, 4,600 feet from mine mouth)	8,955	A	1	3.5	13.0	77.6	5.9	.7					3.0				22	
Same (pillar, 2 main entry, 9 right entry, 4,500 feet from mine mouth)	8,956	A	1	3.6	14.5	76.7	5.2	.9					3.0				22	
Same (pillar, 1 room, 5 left entry, 2,500 feet from mine mouth)	8,957	A	1	3.6	14.0	77.9	4.5	.6					2.8				22	
Same (pillar, 3 left entry, main entry, 1,200 feet from mine mouth)	8,958	A	1	8.2	12.5	74.5	4.8	.7					7.3				22	
Same (composite of samples 8,954 to 8,958 inclusive)	9,023	A	1	4.6	13.5	76.7	5.2	.8	4.7	81.7	1.4	6.2	3.7	7,975	14,360		22	
			2		14.0	80.6	5.4	.8	4.3	85.7	1.4	2.4		8,365	15,060			
			3		15.0	85.0		.8	4.6	90.6	1.5	2.5		8,845	15,920			
3½ miles southwest of; Eureka No. 39 mine, Upper Kittanning bed (face of 7 south entry, 1 left entry, 5,300 feet from mine mouth)	8,969	A	1	3.0	12.0	76.8	8.2	1.4					2.3				22	
Same (face of 16 room, 9 south entry, 1 right entry, 5,300 feet from mine mouth)	8,970	A	1	3.0	12.5	76.2	8.3	1.1					2.4				22	
Same (face of 7 north entry, 1 right entry, 5,100 feet from mine mouth)	8,971	A	1	2.9	15.0	74.7	9.4	1.6					2.2				22	
Same (face of 20 room, 4 north entry, 1 right entry, 4,700 feet from mine mouth)	8,972	A	1	3.1	13.0	75.8	8.1	1.6					2.4				22	
Same (face of main entry, 5,200 feet from mine mouth)	8,973	A	1	2.9	13.0	76.2	7.9	1.0					2.3				22	
Same (face of 9 left entry, main entry, 5,300 feet from mine mouth)	8,974	A	1	3.2	13.0	75.6	8.2	2.3					2.7				22	
Same (composite of samples 8,969 to 8,974 inclusive)	9,030	A	1	3.3	13.0	75.4	8.3	1.5	4.3	79.8	1.3	4.8	2.4	7,740	13,930		22	
			2		13.5	77.9	8.6	1.6	4.1	82.5	1.4	1.8		8,005	14,410			
			3		14.5	85.5		1.7	4.4	90.3	1.5	2.1		8,760	15,770			
4 miles southwest of; on Stoney Creek, above Border Station, B. & O. Railroad, Somerset and Cambria mine, Lower Kittanning bed.	3,837	B	1	1.8	15.2	73.2	9.8	4.5	4.2	77.1	1.4	3.0	1.1	7,611	13,700		22	
			2		15.5	74.5	10.0	4.6	4.0	78.5	1.4	1.5		7,750	13,950			
			3		17.2	82.8		5.1	4.5	87.2	1.6	1.6		8,606	15,490			
9 miles south of; Lochrie Arrow mine, Lower Kittanning bed (face of 7 room, 1 left entry, 250 feet northeast of mine mouth)	20,292	A	1	3.0	18.4	72.2	6.4	1.4					2.6	7,889	14,200	2,440	123	
Same (face of 3 left entry, 900 feet northeast of mine mouth)	20,293	A	1	3.2	18.2	71.4	7.2	1.6					2.7	7,828	14,090	2,320	123	
Same (face of 2 left entry, 700 feet north of mine mouth)	20,294	A	1	3.8	18.4	71.7	6.1	1.0					3.3	7,850	14,130	3,010	123	
Same (face of crosscut, main aircourse, 1,100 feet east of mine mouth)	20,295	A	1	3.4	17.4	72.0	7.2	1.5					2.9	7,806	14,050	2,330	123	
Same (composite of samples 20,292 to 20,295 inclusive).	20,296	A	1	3.4	18.1	71.7	6.8	1.4	4.7	80.9	1.4	4.8	2.9	7,839	14,110		123	
			2		18.7	74.3	7.0	1.4	4.4	83.7	1.5	2.0		8,117	14,610			
			3		20.1	79.9		1.5	4.8	90.0	1.6	2.1		8,728	15,710			
Same (pillar of 3 room, 2 right entry, 200 feet southeast of mine mouth)	20,298	A	1	4.4	17.2	72.5	5.9	1.5					4.0	7,817	14,070	2,510	123	
			2		18.0	75.8	6.2	1.5						8,178	14,720			
Zimmerman; Ralphton No. 6 mine, Upper Freeport bed (at face, 1200 feet east of shaft).	17,690	B	1	3.2	17.1	64.6	15.1	1.5	4.4	72.7	1.3	5.0	2.4	7,161	12,890	2,600	123	
			2		17.7	66.7	15.6	1.5	4.2	75.1	1.4	2.2		7,400	13,320			
			3		20.9	79.1		1.8	4.9	89.0	1.6	2.7		8,772	15,790			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Ultimate. Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TIOGA COUNTY																		
Antrim, ½ mile west of; Anna S. mine, Bloss bed (face of room, side entry. 1 mile from mine mouth)	17,453	B	1	1.9	20.6	65.0	12.5	2.9					1.1	7,306	13,150	2,500	123	
			2		21.0	66.2	12.8	2.9						7,444	13,400			
1 mile south of; Meredith mine, Cushing (E) bed (face of 3 room, 1 left heading).	82,052	B	1	3.4	24.8	63.0	8.8	2.4					3.1	7,522	13,540	2,240		
Same (face of 1 left heading, upper bench)	82,053	B	1	4.0	23.1	66.5	6.4	1.3					3.8	7,756	13,960	2,570		
Same (face of 1 left heading, lower bench).	82,054	B	1	2.6	24.4	60.8	12.2	1.2					2.4	7,256	13,060	3,010		
Same (composite of samples 82,052 to 82,054 inclusive).	82,055	B	1	3.5	24.0	63.2	9.3	1.7	4.9	76.2	1.0	6.9	3.1	7,544	13,580			
			2		24.9	65.5	9.6	1.8	4.6	79.0	1.0	4.0		7,817	14,070			
			3		27.5	72.5		2.0	5.1	87.4	1.1	4.4		8,644	15,560			
Arnot; Blossburg No. 1, mine, Bloss bed (face of 2 right heading, main heading, 2 south heading).	82,251	B	1	2.4	19.1	61.2	17.3	.8					2.3	6,811	12,260	3,010		
Same (face of 7 right heading, main south heading).	82,252	B	1	2.2	18.8	60.7	18.3	.7					2.0	6,733	12,120	3,010		
Same (right rib of 3 room, 30 feet from face, 13 left heading, main south heading)	82,253	B	1	2.4	20.0	65.0	12.6	.9					2.2	7,261	13,070	3,010		
Same (composite of samples 82,251 to 82,253 inclusive).	82,254	B	1	2.3	20.0	61.6	16.1	.8	4.3	70.8	1.1	6.9	2.1	6,939	12,490			
			2		20.5	63.0	16.5	.8	4.1	72.5	1.1	5.0		7,106	12,790			
			3		24.5	75.5		1.0	4.9	86.8	1.3	6.0		8,500	15,300			
Landrus, ½ mile north of; Bear Run mine, Bloss bed (pillar, main entry, 700 feet from mine mouth).	17,452	B	1	2.4	19.7	65.2	12.7	2.5					1.5	7,289	13,120	2,500	123	
			2		20.2	66.8	13.0	2.5						7,461	13,430			
Morris Run; New mine, Morgan bed (face of 4 room, 1 east entry, 1 mile from mine mouth).	17,451	B	1	1.7	21.5	67.6	9.2	1.7	4.5	78.5	1.4	4.7	.8	7,672	13,810	2,620	123	
			2		21.9	68.7	9.4	1.8	4.4	79.8	1.4	3.2		7,800	14,040			
					24.1	75.9		1.9	4.9	88.1	1.6	3.5		8,611	15,500			
Same Bloss bed (Sterling entry, 3 miles from mine mouth).	17,454	B	1	2.3	20.9	66.9	9.9	1.3	4.5	78.2	1.4	4.7	1.5	7,567	13,620	2,900	123	
			2		21.4	68.5	10.1	1.3	4.4	80.0	1.5	2.7		7,744	13,940			
			3		23.8	76.2		1.5	4.9	89.0	1.6	3.0		8,617	15,510			
No. 12 mine, Bloss bed (face of 3 west heading).	82,228	B	1	3.2	17.3	71.5	8.0	.7					2.9	7,661	13,790			
Same (left rib of 4 room, 40 feet from face of 3 west heading)	82,229	B	1	3.6	16.7	71.0	8.7	.7					3.3	7,544	13,580	3,010		
Same (face of 2 room, 4 west heading).	82,230	B	1	2.9	17.8	70.6	8.7	10.0					2.7	7,617	13,710	2,960		
Same (composite of samples, 82,228 to 82,230 inclusive).	82,231	B	1	3.2	18.1	70.3	8.4	.9	4.5	78.6	1.1	6.5	3.0	7,622	13,720			
			2		18.7	72.6	8.7	.8	4.3	81.2	1.2	3.8		7,877	14,180			
			3		20.5	79.5		.9	4.7	89.0	1.3	4.1		8,628	15,530			

No. 13 mine, Seymour bed, (face of 4 right heading)	82,232	B	1	3.3	18.9	66.9	10.9	2.7					3.1	7,411	13,340	2,420		
Same (face of ½ east heading)	82,233	B	1	3.4	18.5	69.6	8.5	2.3					3.1	7,633	13,740	2,450		
Same (face of 6 west heading).	82,234	B	1	3.6	19.8	70.0	6.6	3.2					3.2	7,822	14,080	2,450		
Same (composite of samples 82,232 to 82,234 inclusive).	82,240	B	1	3.4	19.1	68.9	8.6	2.7	4.7	77.5	1.1	5.4	3.1	7,633	13,740			
			2		19.8	71.3	8.9	2.8	4.5	80.3	1.1	2.4		7,894	14,210			
			3		21.7	78.3		3.1	4.9	88.1	1.2	2.7		8,672	15,610			
No. 16 mine, Morgan bed (left rib, 5 right heading, 100 feet from face of 1 east south heading)	82,224	B	1	3.4	21.5	63.4	11.7	1.8					3.1	7,267	13,080	2,910		
Same (face of 10 room, 4 right heading, 1 east south heading).	82,225	B	1	2.1	21.0	64.9	12.0	1.8					1.9	7,361	13,250	2,960		
Same (face of 10 room, 4 right heading, 1 east from mine mouth).	82,225	B	1	2.8	18.7	68.2	10.3	1.0					2.5	7,467	13,440	2,960		
Same (composite of samples 82,224 to 82,226 inclusive).	82,227	B	1	2.8	20.4	65.4	11.4	1.5	4.6	75.3	1.2	6.0	2.5	7,478	13,460			
			2		21.0	67.3	11.7	1.6	4.4	77.5	1.2	3.6		7,689	13,840			
			3		23.8	76.2		1.8	5.0	87.7	1.4	4.1		8,711	15,680			
WASHINGTON COUNTY.																		
Acheson; Acheson mine, Pittsburgh bed (1,600 feet southwest of mine mouth).	3,442	A	1	3.2	32.3	58.6	5.9	1.2					2.0				22	
Same (110 feet west of mine mouth)	3,441	A	1	2.6	32.5	59.3	5.6	1.2					1.4	7,878	14,180		22	
			2		33.3	60.9	5.8	1.2						8,089	14,560			
½ mile east of; Blaine Twp. William Milroy Coal bank, Waynesburg bed.	2,631	B	1	4.3	30.4	45.0	20.3	2.6					1.7				22	
			2		31.8	47.0	21.2	2.7										
Anderson (Venetta); Blanche mine, Pittsburgh bed (main bench).	1,033	B	1	1.7	37.2	55.8	5.3	1.1						7,967	14,340		22	
			2		37.8	56.8	5.4	1.2						8,100	14,580			
Arden, 1 mile northwest of; Arden No. 2 mine, Pittsburgh bed (face of 18 room, 6 right entry, 18 face entry).	80,529	B	1	4.0	38.1	50.2	7.7	2.6	5.6	72.5	1.3	10.3	2.6	7,283	13,110	2,200		
			2		39.6	52.4	8.0	2.7	5.3	75.5	1.3	7.2		7,584	13,650			
			3		43.1	56.9		2.9	5.8	82.1	1.4	7.8		8,245	14,840			
Avella, 2 miles west of; Penobscott mine, Pittsburgh bed (face of 15 room, 8 left entry, main entry, 2,500 feet northwest of mine mouth).	15,673	B	1	4.3	37.0	52.9	5.8	1.9	5.3	74.1	1.5	11.4	2.1	7,389	13,300	2,110	85	
			2		38.7	55.2	6.1	2.0	5.1	77.5	1.6	7.7		7,722	13,900			
			3		41.2	58.8		2.1	5.4	82.5	1.7	8.3		8,228	14,810			
Same (face of room, 7 right entry, 3,100 feet northeast of mine mouth).	15,674	B	1	4.3	37.8	51.6	6.3	2.2					1.7	7,400	13,320	2,040	85	
			2		39.5	53.9	6.6	2.3						7,728	13,910			
Biard; Schoenberger mine, Pittsburgh bed (face of 10 room, 32 entry, 12 face entry, 4,000 feet southeast of mine mouth).	11,164	A	1	2.3	34.6	57.5	5.6	1.0					1.1			2,370	85	
Same (face of 4 room, 32 entry, 11 face entry, 4,000 feet southeast of mine mouth).	11,165	A	1	2.7	34.1	57.3	5.9	1.2					1.6			2,520	85	
Same (face of right main entry, 7,000 feet south of mine mouth).	11,166	A	1	9.5	31.0	53.5	6.0	1.0					8.4			2,470	85	
Same (face of 11 room, 32 entry, right main entry, 6,000 feet south of mine mouth)	11,167	A	1	3.5	33.0	57.9	5.6	1.0					2.3			2,310	85	
Same (face of 11 entry, 4,800 feet southeast of mine mouth).	11,168	A	1	3.9	33.6	56.7	5.8	.9					2.7			2,490	85	
Same (pillar in 29 right entry, main entry, 5,500 feet south of mine mouth).	11,169	A	1	2.6	34.3	57.6	5.5	1.1					1.4			2,450	85	
Same (composite of samples 11,164 to 11,169 inclusive).	11,170	A	1	3.9	33.6	56.8	5.7	1.0	5.3	77.2	1.4	9.4	2.9	7,678	13,820		85	
			2		34.9	59.2	5.9	1.1	5.1	80.4	1.4	6.1		7,989	14,380			
			3		37.1	62.9		1.2	5.4	85.4	1.5	6.5		8,494	15,290			

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Ultimate. Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
WASHINGTON COUNTY—Continued.																		
Besco; Champion mine, Pittsburgh bed (face of 6 butt heading).	83,850	B	1	2.9	33.6	55.0	8.5	1.0	-----	-----	-----	-----	2.0	7,421	13,360	2,390	-----	-----
Same (face of 1 room, main heading)	83,851	B	1	2.8	34.1	57.1	6.0	.9	-----	-----	-----	-----	1.9	7,619	13,710	2,390	-----	-----
Same (right rib stump of 3 room, 200 feet from 2 right face heading).	83,852	B	1	2.4	36.4	54.5	6.7	2.2	-----	-----	-----	-----	1.5	7,655	13,780	2,340	-----	-----
Same (composite of samples 83,850 to 83,852 inclusive)	83,853	B	1	2.7	34.6	55.8	6.9	1.4	5.3	76.6	1.6	8.2	1.8	7,578	13,640	-----	-----	-----
			2	-----	35.6	57.3	7.1	1.4	5.1	78.7	1.6	6.1	-----	7,789	14,020	-----	-----	-----
			3	-----	38.3	61.7	-----	1.5	5.5	84.7	1.7	6.6	-----	8,383	15,090	-----	-----	-----
½ mile north of; Hupp county bank, Waynesburg bed (at face, 75 feet north of mine mouth).	84,427	B	1	3.7	34.8	45.7	15.8	4.3	-----	-----	-----	-----	3.0	6,666	12,000	2,150	-----	-----
			2	-----	36.1	47.5	16.4	4.4	-----	-----	-----	-----	-----	6,919	12,460	-----	-----	-----
Buffalo, 1¾ miles south of; Imhoff bank, Washington bed lower bench).	2,630	B	1	4.5	33.5	49.5	12.5	3.0	-----	-----	-----	-----	2.1	6,800	12,240	-----	22	-----
			2	-----	35.1	51.8	13.1	3.2	-----	-----	-----	-----	-----	7,117	12,810	-----	-----	-----
Charleroi; Charleroi mine, Pittsburgh bed (4,000 feet northwest of mine mouth).	3,422	A	1	2.6	34.6	55.8	7.0	2.3	-----	-----	-----	-----	1.3	-----	-----	-----	22	-----
Same (4,000 feet southwest of mine mouth)	3,421	A	1	2.5	34.7	57.5	5.3	1.1	-----	-----	-----	-----	1.2	7,861	14,150	-----	22	-----
			2	-----	35.5	59.0	5.5	1.2	-----	-----	-----	-----	-----	8,061	14,510	-----	-----	-----
Denbo, 1 mile north of; Baker country bank, Sewickley bed (20 feet from outcrop).	84,010	B	1	1.9	37.0	48.3	12.8	3.9	-----	-----	-----	-----	1.5	7,169	12,900	2,130	-----	-----
			2	-----	37.7	49.3	13.0	4.0	-----	-----	-----	-----	-----	7,308	13,150	-----	-----	-----
1½ miles north of; Ropp country bank, Waynesburg bed (face of main entry, 75 feet from opening)	84,009	B	1	6.2	29.4	47.8	16.6	2.3	-----	-----	-----	-----	5.4	6,301	11,340	2,220	-----	-----
			2	-----	31.3	51.0	17.7	2.5	-----	-----	-----	-----	-----	6,717	12,090	-----	-----	-----
Ellsworth; Ellsworth No. 1 mine, Pittsburgh bed (17 room, 5 north butt entry, 3,000 ft. north of shaft)	1,967	A	1	2.9	33.7	58.0	5.4	1.1	-----	-----	-----	-----	1.5	-----	-----	-----	22	-----
Same (face of main entry)	1,047	B	1	1.2	36.3	56.2	6.3	.8	-----	-----	-----	-----	-----	7,917	14,250	-----	22	-----
			2	-----	36.7	57.0	6.3	.9	-----	-----	-----	-----	-----	8,011	14,420	-----	-----	-----
Ellsworth No. 2 mine, Pittsburgh bed (face of main entry)	1,050	B	1	1.1	36.7	57.2	5.1	.9	-----	-----	-----	-----	-----	-----	-----	-----	22	-----
Same (10 room, 1 butt entry, 3,000 feet southeast of shaft)	1,966	A	1	3.0	33.5	58.7	4.8	.7	-----	-----	-----	-----	1.5	7,889	14,200	-----	22	-----
			2	-----	34.5	60.5	5.0	.8	-----	-----	-----	-----	-----	8,133	14,640	-----	-----	-----
Finleyville, 2 miles from; Cincinnati mine, Pittsburgh bed (6 butt entry, 14 face entry, 60 feet outby last cut through, 6,200 feet northwest of Mingo slope mouth)	17,082	A	1	2.8	35.2	55.3	6.7	1.1	-----	-----	-----	-----	1.6	7,567	13,620	2,550	85	-----

Same (10 butt entry, 14 face entry, 60 feet inby 2 room, 6,800 feet northwest of Mingo slope mouth)	17,083	A	1	3.2	35.1	55.8	5.9	1.1	----	----	----	----	2.1	7,594	13,670	2,350	85	----
Same (12 butt entry, 14 face entry, inby 1 cross-cut, 7,400 feet northwest of Mingo slope mouth)	17,084	A	1	2.9	35.8	54.8	6.5	1.3	----	----	----	----	1.5	7,611	13,700	2,370	85	----
Same (composite of samples 17,082 to 17,084 inclusive)	17,085	A	1	3.0	35.2	55.4	6.4	1.2	5.5	77.1	1.4	8.4	1.8	7,589	13,660	----	85	----
			2	----	36.3	57.1	6.6	1.2	5.3	79.5	1.5	5.9	----	7,822	14,080	----	----	----
			3	----	38.9	61.1	----	1.3	5.7	85.1	1.6	6.3	----	8,378	15,080	----	----	----
Frankfort (Beaver County, 1 mile southeast of; Ollum country bank, Pittsburgh bed	1,072	B	1	1.5	38.2	48.6	11.7	4.1	----	----	----	----	----	----	----	----	22	----
Hackett; Nottingham mine, Pittsburgh bed (breast and bottom).	1,035	B	1	1.7	37.0	56.5	4.8	1.2	----	----	----	----	----	----	----	----	22	----
Russell mine, Redstone bed (entire bed)	1,034	B	1	1.5	35.6	53.3	9.6	2.1	----	----	----	----	----	----	----	----	22	----
London School; Matchett country bank, Pittsburgh bed)	1,051	B	1	2.5	38.7	49.2	9.6	1.9	----	----	----	----	----	7,317	13,170	----	22	----
			2	----	39.7	50.5	9.8	1.9	----	----	----	----	----	7,506	13,510	----	----	----
Manifold; Manifold mine, Pittsburgh bed	1,055	B	1	1.4	37.1	53.8	7.7	1.6	----	----	----	----	----	----	----	----	22	----
Marianna (near Ellsworth); Rachel and Agnes mine, Pittsburgh bed (first supply butt raise, air-course).	6,858	A	1	1.4	34.6	57.8	6.2	.8	5.2	78.8	1.4	7.6	----	7,911	14,210	----	22	----
			2	----	35.1	58.6	6.3	.8	5.1	79.9	1.5	6.4	----	8,028	14,450	----	----	----
			3	----	37.5	62.5	----	.8	5.5	85.3	1.6	6.8	----	8,567	15,420	----	----	----
Same (right dip loaded track, 650 feet northwest of Fulton shaft).	6,859	A	1	1.4	33.9	58.3	6.4	1.3	5.3	78.4	1.4	7.2	----	7,883	14,190	----	22	----
			2	----	34.4	59.1	6.5	1.3	5.2	79.5	1.4	6.1	----	8,000	14,400	----	----	----
			3	----	36.7	63.3	----	1.4	5.6	85.1	1.5	6.4	----	8,550	15,390	----	----	----
Same Agnes mine, (last open crosscut, between 1 and 2 Blanche entries, 3,000 feet southwest of mine mouth).	7,432	A	1	2.1	32.9	59.4	5.6	1.2	----	----	----	----	1.0	----	----	----	22	----
Same (1,800 feet north of Agnes shaft)	7,459	A	1	2.2	32.3	58.4	7.1	1.6	----	----	----	----	1.4	----	----	----	22	----
Same (1,200 feet northeast of mine mouth)	7,460	A	1	2.3	33.0	59.2	5.5	.9	----	----	----	----	1.4	----	----	----	22	----
Same Marianna mine, (left rib, close to face of 1 Blanche heading).	7,157	A	1	1.9	33.1	59.0	6.0	1.1	----	----	----	----	.8	----	----	----	22	----
Meadowlands; McLain mine, Pittsburgh bed	1,032	B	1	1.9	36.2	53.7	8.2	1.5	----	----	----	----	----	----	----	----	22	----
Millsboro: Agnes mine, Pittsburgh bed (face of main heading).	83,966	B	1	2.6	36.1	53.3	8.0	1.8	----	----	----	----	1.8	7,529	13,550	2,180	----	----
Same (face of 12 room, left of main heading)	83,967	B	1	2.9	34.3	54.2	8.6	1.6	----	----	----	----	2.1	7,424	13,360	2,260	----	----
Same (left rib, back heading, opposite 19 room)	83,968	B	1	2.6	34.7	53.2	9.5	1.8	----	----	----	----	1.8	7,338	13,210	2,200	----	----
Same (composite of samples 83,966 to 83,968 inclusive).	83,969	B	1	2.7	35.0	53.9	8.4	1.7	5.2	74.7	1.6	8.4	1.9	7,461	13,430	----	----	----
			2	----	36.0	55.4	8.6	1.7	5.0	76.8	1.6	6.3	----	7,668	13,800	----	----	----
			3	----	39.4	60.6	----	1.9	5.5	84.0	1.8	6.8	----	8,389	15,100	----	----	----
Monongahela City; Catsburg mine, Pittsburgh bed (face of 66 butt entry, 2½ miles northeast of mine mouth).	11,157	A	1	2.8	33.6	57.1	6.5	1.1	----	----	----	----	1.7	----	----	2,420	85	----
Same (rib of 17 room, 75 entry, 2⅔ miles northeast of mine mouth)	11,158	A	1	2.7	33.4	58.1	5.8	.8	----	----	----	----	1.6	----	----	2,450	85	----
Same (face of 23 room, 79 butt entry, 2¾ miles north of mine mouth).	11,159	A	1	3.1	33.3	57.8	5.8	1.0	----	----	----	----	1.9	----	----	2,450	85	----
Same (chain pillar at 40 room, 74 butt entry, 2½ miles northwest of mine mouth).	11,160	A	1	2.7	32.8	58.0	6.5	.8	----	----	----	----	1.6	----	----	2,610	85	----
Same (face of north 2 main entry, 2½ miles north of mine mouth).	11,161	A	1	2.9	33.7	55.8	7.6	2.0	----	----	----	----	1.9	----	----	2,140	85	----
Same (face of 101 room, 68 butt entry, 2¾ miles northwest of mine mouth).	11,162	A	1	2.9	33.4	57.6	6.1	1.1	----	----	----	----	1.9	----	----	2,470	85	----
Same (composite of samples 11,157 to 11,162 inclusive).	11,163	A	1	2.8	32.5	57.3	6.4	1.1	5.4	77.2	1.3	8.6	1.8	7,706	13,870	----	85	----
			2	----	34.5	58.9	6.6	1.1	5.2	79.4	1.4	6.3	----	7,928	14,270	----	----	----
			3	----	36.9	63.1	----	1.2	5.6	85.0	1.5	6.7	----	8,483	15,270	----	----	----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
WASHINGTON COUNTY—Continued.																		
Murdocksville; Natural outcrop on Bigger Run, Ames bed.	1,065	B	1	2.2	39.2	52.5	6.1	3.6									22	
Paris; Fulton country bank, Pittsburgh bed	1,070	B	1	2.0	39.1	47.2	11.7	3.9									22	
Sodom School; Matchett country bank, Pittsburgh bed	1,591	B	1	3.1	38.3	52.2	6.4	1.8					1.2				22	
Warriors Point; McCausland country bank, Pittsburg bed.	1,069	B	1	3.0	35.8	48.5	12.7	3.3									22	
Westland; Midland No. 3 mine, Pittsburgh bed	1,590	B	1	3.6	34.2	51.2	11.0	1.9					1.6				22	
West Brownsville Junction; ½ mile north of; Lilley mine, Pittsburgh bed. (face of 1 main heading)	84,019	B	1	2.4	34.1	55.5	8.0	1.7					1.7	7,552	13,590	2,220		
Same (face of 6 room, 2 butt heading, 8 south heading).	84,020	B	1	2.5	34.1	55.4	8.0	1.2					1.8	7,540	13,570	2,570		
Same (face of 15 room, 2 butt heading, 8 north heading).	84,021	B	1	2.6	34.2	55.4	7.8	1.5					1.9	7,537	13,570	2,240		
Same (face of 1 room, 1 butt heading, 7 face north heading).	84,022	B	1	2.9	34.0	55.3	7.8	1.1					2.2	7,525	13,550	2,370		
Same (face of 4 room, 1 butt heading, 6 face south heading).	84,023	B	1	2.8	32.5	57.2	7.5	1.0					2.2	7,590	13,660	2,740		
Same (face of 6 room, 1 butt heading, 6 face north heading).	84,024	B	1	2.5	33.6	56.0	7.9	1.4					1.9	7,526	13,550	2,510		
Same (composite of samples 84,019 to 84,024 inclusive).	84,025	B	1	2.7	33.6	55.9	7.8	1.3	5.2	76.2	1.6	7.9	2.0	7,524	13,540			
			2		34.5	57.5	8.0	1.3	5.0	78.3	1.6	5.8		7,733	13,920			
			3		37.5	62.5		1.4	5.4	85.1	1.7	6.4		8,405	15,130			
1 mile southwest of; Vesta No. 7 mine, Pittsburgh bed (face of 1 left heading, main heading).	83,961	B	1	3.0	32.4	57.7	6.9	.9					2.5	7,599	13,680	2,340		
Same (face of 1 right entry)	83,962	B	1	3.3	32.6	55.4	8.7	1.2					2.8	7,425	13,370	2,680		
Same (face of 9 butt heading)	83,963	B	1	2.8	34.0	54.4	8.8	1.0					2.1	7,468	13,440	2,680		
Same (face of 3 main heading)	83,964	B	1	2.4	34.5	55.4	7.7	1.1					1.7	7,618	13,710	2,620		
Same (composite of samples 83,961 to 83,964 inclusive).	83,965	B	1	2.9	33.2	55.9	8.0	1.0	5.3	76.0	1.7	8.0	2.3	7,523	13,540			
			2		34.2	57.6	8.2	1.0	5.1	78.3	1.8	5.6		7,748	13,940			
			3		37.3	62.7		1.1	5.6	85.3	2.0	6.0		8,440	15,190			

Zollarsville; Horn country bank, Waynesburg bed (lower bench).	1,589	B	1	2.3	32.4	47.1	18.2	2.9					1.3				22	
Same (upper bench).	1,588	B	1	2.9	31.7	45.7	19.7	4.4					1.7				22	
WESTMORELAND COUNTY.																		
Adamsburg, ¼ mile west of; Adamsburg mine, Redstone bed (rib of 3 flat heading).	84,158	B	1	2.2	35.0	53.3	9.5	1.9					1.7	7,400	13,320	2,450		
Same (face of 5 room, main left heading)	84,159	B	1	2.5	33.3	55.5	8.7	1.0					2.1	7,433	13,380	2,850		
Same (composite of samples 84,158 and 84,159)	84,160	B	1	2.4	34.2	54.4	9.0	1.5	5.2	74.6	1.4	8.3	1.9	7,407	13,340			
			2		35.0	55.8	9.2	1.5	5.0	76.3	1.5	6.5		7,589	13,660			
			3		38.6	61.4		1.6	5.5	84.1	1.6	7.2		8,344	15,050			
Alverton, 1 mile north of; Fox country bank, Sewickley bed (face of main entry, 100 feet from mine mouth).	85,353	B	1	2.3	33.6	56.3	7.8	2.2					1.6	7,628	13,730	2,240		
			2		34.4	57.6	8.0	2.3						7,806	14,050			
Apollo, ½ mile west of; Paulton mine, Upper Freeport bed (face of 26 room, 12 right butt heading, main heading).	85,664	B	1	2.0	35.6	55.0	7.4	2.0					1.0	7,600	13,680	2,200		
Same (face of 3 left butt heading, new main heading).	85,665	B	1	2.5	34.2	54.7	8.6	2.2					1.6	7,506	13,510	2,180		
Same (face of new main heading, 8,000 feet northwest of mine mouth).	85,666	B	1	2.7	35.4	53.9	8.0	2.0					1.7	7,533	13,560	2,150		
Same (composite of samples 85,664 to 85,666 inclusive).	85,667	B	1	2.4	35.3	54.3	8.0	2.1	5.4	75.3	1.4	7.8	1.5	7,556	13,600			
			2		36.2	55.6	8.2	2.1	5.2	77.2	1.5	5.8		7,739	13,930			
			3		39.4	60.6		2.3	5.7	84.1	1.6	6.3		8,433	15,180			
Blairsville Intersection, ¼ mile east of; Packsaddle No. 1 mine, Upper Freeport bed (face of dip aircourse, 250 feet from mine mouth).	85,403	B	1	3.1	26.8	62.5	7.6	1.2					2.6	7,661	13,790	2,570		
Same (face of main entry, 600 feet from mine mouth)	85,404	B	1	2.2	27.4	62.4	8.0	1.4					2.0	7,694	13,850	2,390		
Same (composite of samples 85,403 and 85,404)	85,405	B	1	2.7	26.9	62.7	7.7	1.2	4.9	77.9	1.3	7.0	2.3	7,694	13,850			
					27.6	64.5	7.9	1.3	4.7	80.1	1.3	4.7		7,906	14,230			
			3		30.0	70.0		1.4	5.1	87.0	1.4	5.1		8,589	15,460			
Boliver, ½ mile east of; McFeely Brick "B" mine, Lower Kittanning bed (face of 7 room, main heading, 700 feet southwest of mine mouth).	85,576	B	1	2.6	20.5	67.6	9.3	3.0					2.0	7,689	13,730	2,280		
Same (face of 3 right heading, main heading, 700 feet west of mine mouth).	85,577	B	1	2.9	21.3	67.2	8.6	3.1					2.4	7,639	13,750	2,240		
Same (composite of samples 85,576 and 85,577)	85,578	B	1	2.7	20.9	67.4	9.0	3.0	4.7	77.2	1.3	4.8	2.2	7,622	13,720			
			2		21.5	69.2	9.3	3.1	4.5	79.3	1.3	2.5		7,839	14,110			
			3		23.6	76.4		3.4	5.0	87.5	1.4	2.7		8,639	15,550			
McFeely Brick "E" mine, Upper Freeport bed (face of 2 room, 2 right heading).	85,579	B	1	2.2	25.9	63.0	8.9	3.4					1.7	7,661	13,790	2,240		
Same (face of 6 room, 2 right heading)	85,580	B	1	2.3	27.2	63.0	7.5	3.1					1.6	7,728	13,910	2,220		
Same (composite of samples 85,579 and 85,580)	85,581	B	1	2.3	26.2	63.4	8.1	3.2	4.9	77.4	1.5	4.9	1.7	7,694	13,850			
			2		26.8	64.9	8.3	3.3	4.7	79.2	1.6	2.9		7,872	14,170			
			3		29.3	70.7		3.6	5.1	86.4	1.7	3.2		8,583	15,450			
Darlington; Shirey mine, Lower Freeport bed (face of room, 1 left butt heading).	85,347	B	1	3.0	25.1	63.8	8.1	2.2					2.5	7,667	13,800	2,120		
Same (face of main heading)	85,348	B	1	3.0	25.1	63.0	8.9	2.8					2.6	7,589	13,660	2,010		
Same (composite of samples 85,347 and 85,348)	85,349	B	1	3.0	25.0	63.5	8.5	2.5	5.0	77.1	1.3	5.6	2.6	7,606	13,690			
			2		25.8	65.4	8.8	2.6	4.8	79.5	1.4	2.9		7,839	14,110			
			3		28.3	71.7		2.9	5.2	87.2	1.5	3.2		8,504	15,470			

*, †, ‡, §, ¶. See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Sample. Kind.†	Sample. Condition.‡	Proximate. Moisture.	Proximate. Volatile matter.	Proximate. Fixed carbon.	Proximate. Ash.	Ultimate. Sulphur.	Ultimate. Hydrogen.	Ultimate. Carbon.	Ultimate. Nitrogen.	Ultimate. Oxygen.	Air-drying loss.	Calorific value. Calories.	Calorific value. British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	References.¶ Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
WESTMORELAND COUNTY—Continued.																		
1 mile north of; Segar mine, Upper Freeport bed (face of 1 right heading).	85,350	B	1	3.3	25.4	58.9	12.4	3.7	-----	-----	-----	-----	2.8	7,183	12,930	2,090	-----	-----
Same (right rib of main heading, 500 feet from mine mouth).	85,351	B	1	3.0	25.4	58.9	12.7	3.4	-----	-----	-----	-----	2.6	7,172	12,910	2,090	-----	-----
Sample (composite of samples 85,350 and 85,351)	85,352	B	1	3.2	25.1	59.1	12.6	3.5	4.7	72.3	1.2	5.7	2.7	7,183	12,930	-----	-----	-----
			2	-----	26.0	61.0	13.0	3.6	4.4	74.6	1.2	3.2	-----	7,422	13,360	-----	-----	-----
			3	-----	29.8	70.2	-----	4.2	5.1	85.7	1.4	3.6	-----	8,528	15,350	-----	-----	-----
Derry, ¼ mile west of; Decco mine, Upper Freeport bed (face of 3 room, 2 right parallel heading).	85,344	B	1	2.5	26.8	59.5	11.2	1.4	-----	-----	-----	-----	2.2	7,372	13,270	2,800	-----	-----
Same (face of 12 room, 1 left heading)	85,345	B	1	3.1	25.8	60.3	10.8	1.6	-----	-----	-----	-----	2.6	7,361	13,250	2,570	-----	-----
Same (composite of samples 85,344 and 85,345)	85,346	B	1	2.9	25.7	60.4	11.0	1.5	4.8	74.9	1.2	6.6	2.4	7,356	13,240	-----	-----	-----
			2	-----	26.5	62.2	11.3	1.6	4.6	77.2	1.3	4.0	-----	7,578	13,640	-----	-----	-----
			3	-----	29.9	70.1	-----	1.8	5.2	87.0	1.4	4.6	-----	8,544	15,380	-----	-----	-----
Donohoe, 3 miles northeast of; John Sreanko custom bank, Upper Freeport bed (face of 1 left heading)	85,335	B	1	1.9	31.7	59.0	7.4	2.2	-----	-----	-----	-----	1.7	7,800	14,040	2,150	-----	-----
Same (face of main heading, 400 feet from mine mouth)	85,336	B	1	1.9	32.0	59.5	6.6	1.7	-----	-----	-----	-----	1.7	7,839	14,110	2,190	-----	-----
Same (composite of samples 85,335 and 85,336)	85,337	B	1	2.0	31.8	59.2	7.0	1.9	5.2	78.0	1.4	6.5	1.7	7,794	14,030	-----	-----	-----
			2	-----	32.4	60.4	7.2	2.0	5.1	79.6	1.5	4.6	-----	7,950	14,310	-----	-----	-----
			3	-----	34.9	65.1	-----	2.1	5.5	85.7	1.6	5.1	-----	8,567	15,420	-----	-----	-----
Edna, ⅓ mile west of; Meyers local bank, Sewickley bed (face of main heading, 50 feet from mine mouth)	84,733	B	1	3.0	34.2	49.1	13.7	3.6	-----	-----	-----	-----	2.5	6,883	12,390	1,990	-----	-----
			2	-----	35.2	50.7	14.1	3.8	-----	-----	-----	-----	-----	7,096	12,770	-----	-----	-----
Eisaman Station, ½ mile east of; Delvitto mine, Mahoning bed (face of main heading).	84,735	B	1	1.9	35.0	54.9	8.2	2.9	-----	-----	-----	-----	1.4	7,591	13,660	1,990	-----	-----
Same (face of 1 left heading)	84,736	B	1	1.9	34.3	55.6	8.2	3.0	-----	-----	-----	-----	1.5	7,578	13,640	1,940	-----	-----
Same (composite of samples 84,735 and 84,736)	84,737	B	1	2.0	35.0	54.8	8.2	2.8	5.3	75.6	1.5	6.6	1.5	7,582	13,650	-----	-----	-----
			2	-----	35.7	55.9	8.4	2.9	5.1	77.2	1.5	4.9	-----	7,735	13,920	-----	-----	-----
			3	-----	39.0	61.0	-----	3.2	5.6	84.2	1.7	5.3	-----	8,444	15,200	-----	-----	-----
Country bank, Mahoning bed (face of main entry, 30 feet from mine mouth). Mine idle.	81,073	B	1	3.3	33.2	52.8	10.7	2.7	-----	-----	-----	-----	2.5	7,239	13,030	2,280	-----	-----
				-----	34.3	54.7	11.0	2.8	-----	-----	-----	-----	-----	7,489	13,480	-----	-----	-----

Export; Elizabeth mine, Pittsburgh bed (face of 5 room, 2 right butt heading, 5 hill section).	84,758	B	1	3.1	34.8	56.7	5.4	1.3	-----	-----	-----	-----	[illegible]	7,748	[illegible]	2,330	-----	-----
Same (2 left face heading, 300 feet from main heading, 4 hill section).	84,759	B	1	5.9	31.2	57.4	5.5	1.0	-----	-----	-----	-----	[illegible]	7,256	[illegible]	[illegible]	-----	-----
Same (face of 1 room, 8 right heading, 3 hill section).	84,760	B	1	2.8	35.2	56.4	5.6	1.5	-----	-----	-----	-----	1.9	7,720	13,900	[illegible]	-----	-----
Same (composite of samples 84,758 to 84,760 inclusive).	84,761	B	1	3.9	33.6	57.0	5.5	1.2	5.4	76.2	1.6	10.1	2.8	7,585	13,650	-----	-----	-----
			2	-----	35.0	59.3	5.7	1.3	5.2	79.3	1.6	6.9	-----	7,893	14,210	-----	-----	-----
			3	-----	37.1	62.9	-----	1.4	5.5	84.1	1.7	7.3	-----	8,368	15,060	-----	-----	-----
Greensburg, 4 miles north of; Jamison No. 2 mine, Pittsburgh bed (face of 19 room, 10 butt entry, 3,500 feet north of shaft).	1,942	A	1	2.7	30.3	57.8	9.1	1.3	-----	-----	-----	-----	1.6	7,561	13,610	-----	22	-----
			2	-----	31.2	59.4	9.4	1.4	-----	-----	-----	-----	-----	7,778	14,000	-----	-----	-----
Same (face of main west entry, 2,000 feet northwest of shaft).	1,943	A	1	2.8	30.9	58.2	8.1	.8	-----	-----	-----	-----	1.7	-----	-----	-----	22	-----
4½ miles west of; J. Miller mine. Bakerstown bed (face of butt entry, 200 yds. from mine mouth).	81,149	B	1	2.2	32.7	44.9	20.2	2.7	-----	-----	-----	-----	1.3	6,461	11,630	2,740	-----	-----
			2	-----	33.4	45.9	20.7	2.7	-----	-----	-----	-----	-----	6,600	11,880	-----	-----	-----
Haydenville, 1 mile southwest of; Hilltop mine, Redstone bed (right rib, 1 right heading, 150 feet from mine mouth).	85,341	B	1	2.2	34.4	53.9	9.5	3.0	-----	-----	-----	-----	1.6	[illegible]	13,460	2,010	-----	-----
Same (face of 2 right heading, 400 feet from mine mouth).	85,342	B	1	2.1	34.4	54.8	8.7	2.8	-----	-----	-----	-----	1.7	7,517	[illegible]	1,960	-----	-----
Same (composite of samples 85,341 and 85,342).	85,343	B	1	2.0	34.7	54.1	9.2	2.9	5.2	74.4	1.5	6.8	1.6	7,511	13,520	-----	-----	-----
			2	-----	35.4	55.3	9.3	2.9	5.1	75.9	1.6	5.2	-----	7,661	13,790	-----	-----	-----
			3	-----	39.1	60.9	-----	3.2	5.6	83.8	1.7	5.7	-----	[illegible]	15,220	-----	-----	-----
Herminie, ½ mile east of; Fairhaven mine, Waynesburg bed (left rib of main heading, 1,000 feet from mine mouth).	84,664	B	1	3.7	31.3	46.5	18.5	2.3	-----	-----	-----	-----	3.0	6,379	11,480	[illegible]	-----	-----
Same (right rib of main heading, 1,500 feet from mine mouth).	84,665	B	1	3.5	31.7	45.5	19.3	3.3	-----	-----	-----	-----	3.0	6,370	11,470	2,390	-----	-----
Same (composite of samples 84,664 and 84,665).	84,666	B	1	3.6	31.1	46.4	18.9	2.8	4.8	63.5	1.4	8.6	3.0	6,369	11,460	-----	-----	-----
			2	-----	32.3	48.1	19.6	2.9	4.5	65.9	1.4	5.7	-----	6,606	[illegible]	-----	-----	-----
			3	-----	40.2	59.8	-----	3.6	5.6	82.0	1.8	7.0	-----	8,217	[illegible]	-----	-----	-----
½ mile north of; Keystone shaft, Pittsburgh bed (4,000 feet southeast of mine mouth).	4,351	A	1	2.8	32.2	58.7	6.3	1.0	-----	-----	-----	-----	1.7	-----	-----	-----	22	-----
Same (face of 7 room, 1 west butt entry, 1,400 feet north of mine mouth).	4,352	A	1	2.0	33.6	58.1	6.3	1.4	-----	-----	-----	-----	1.0	7,861	14,150	-----	22	-----
			2	-----	34.3	59.2	6.5	1.4	-----	-----	-----	-----	-----	[illegible]	14,440	-----	-----	-----
1 mile north of; Edwards No. 4 mine, Waynesburg bed (right room, main entry, 300 yds. from mine mouth).	81,157	B	1	2.6	32.5	44.2	20.7	3.1	-----	-----	-----	-----	2.1	6,411	11,540	2,510	-----	-----
Same (rib near face of main entry, 400 yds. from mine mouth).	81,158	B	1	3.1	31.5	44.1	21.3	3.5	-----	-----	-----	-----	2.5	[illegible]	10,980	2,450	-----	-----
Same (composite of samples 81,157 and 81,158).	81,159	B	1	3.0	32.0	43.9	21.1	3.2	4.8	61.3	1.3	8.3	2.3	6,206	11,170	-----	-----	-----
			2	-----	33.0	45.3	21.7	3.3	4.6	63.1	1.4	5.9	-----	6,394	11,510	-----	-----	-----
			3	-----	42.2	57.8	-----	4.2	5.8	80.7	1.7	7.6	-----	8,167	14,700	-----	-----	-----
Huff, 1½ miles east of; Lawson prospect, Bakerstown bed (in entry. 10 feet from outcrop).	81,072	B	1	1.8	30.6	47.1	20.5	4.3	-----	-----	-----	-----	1.3	6,517	11,730	2,110	-----	-----
			2	-----	31.2	47.9	20.9	4.3	-----	-----	-----	-----	-----	[illegible]	11,950	-----	-----	-----
Hunkers, ½ mile southwest of; Westmoreland Brick mine, Upper Freeport bed (face of 1 right face heading, 2,500 feet from mine mouth).	85,338	B	1	2.6	35.6	54.8	7.0	3.4	-----	-----	-----	-----	2.1	7,756	13,960	1,960	-----	-----
Same (face of 1 right face parallel heading).	85,339	B	1	2.9	34.1	54.1	8.9	3.9	-----	-----	-----	-----	2.4	7,514	13,580	1,960	-----	-----
Same (composite of samples 85,338 and 85,339).	85,340	B	1	2.7	34.8	54.6	7.9	3.6	5.3	75.2	1.3	6.7	2.3	7,628	13,730	-----	-----	-----
			2	-----	35.7	56.2	8.1	3.7	5.1	77.2	1.3	4.6	-----	7,833	14,100	-----	-----	-----
			3	-----	38.9	61.1	-----	4.0	5.6	84.1	1.5	4.8	-----	8,528	15,350	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample. Laboratory No.*	Kind.†	Condition.‡	Proximate. Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ultimate. Hydrogen.	Carbon.	Nitrogen.	Oxygen.	Air-drying loss.	Calorific value. Calories.	British thermal units.	Softening temp. °F.§	References.¶ Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
WESTMORELAND COUNTY—Continued.																		
Jeannette, 1 mile from; Saudell country bank, Upper Freeport (?) bed (face of room, 1 left entry, 150 yds. from mine mouth).	81,074	B	1	2.0	33.6	55.1	9.3	2.9	-----	-----	-----	-----	1.3	7,539	13,570	2,120	-----	-----
			2	-----	34.3	56.2	9.5	2.9	-----	-----	-----	-----	-----	7,691	13,850	-----	-----	-----
2 miles east of; Christman country bank, Mahoning bed (face of entry, 40 feet from outcrop).	81,146	B	1	3.8	29.7	47.9	18.6	7.0	-----	-----	-----	-----	3.0	6,439	11,590	2,020	-----	-----
			2	-----	30.9	49.8	19.3	7.3	-----	-----	-----	-----	-----	6,717	12,040	-----	-----	-----
Jacobs; country bank, Lower Bakerstown bed (5 feet in entry mouth).	81,147	B	1	7.4	28.6	44.7	19.3	1.0	-----	-----	-----	-----	4.7	5,711	10,280	2,280	-----	-----
			2	-----	30.9	48.3	20.8	1.1	-----	-----	-----	-----	-----	6,172	11,110	-----	-----	-----
2¾ miles east of; Small Bros. country bank, Mahoning bed (face of room, main entry, 100 yards from mine mouth).	81,148	B	1	3.7	33.9	54.3	8.1	2.2	-----	-----	-----	-----	2.7	7,445	13,400	2,180	-----	-----
			2	-----	35.2	56.4	8.4	2.3	-----	-----	-----	-----	-----	7,728	13,910	-----	-----	-----
Kingston Station, ¾ mile north of; Barrett mine, Upper Freeport bed (right rib, 4 butt entry, 100 feet from main line heading).	85,406	B	1	3.2	24.2	64.0	8.6	1.1	-----	-----	-----	-----	3.1	7,533	13,620	2,850	-----	-----
Same (face of main line heading).	85,407	B	1	2.5	24.7	63.8	9.0	1.1	-----	-----	-----	-----	2.1	7,639	13,750	2,910	-----	-----
Same (face of 1 right butt entry, main line heading).	85,408	B	1	3.0	24.2	65.5	7.3	.7	-----	-----	-----	-----	2.7	7,717	13,890	2,910	-----	-----
Same (composite of samples 85,406 to 85,408 inclusive).	85,409	B	1	3.0	24.6	64.2	8.2	1.0	5.0	77.8	1.3	6.7	2.6	7,639	13,750	-----	-----	-----
			2	-----	25.4	66.1	8.5	1.0	4.8	80.2	1.3	4.2	-----	7,872	14,170	-----	-----	-----
			3	-----	27.7	72.3	-----	1.1	5.3	87.6	1.4	4.6	-----	8,606	15,490	-----	-----	-----
Laughlinstown; Darr custom bank, Upper Freeport bed (face of main entry, 75 feet from mine mouth).	85,354	B	1	3.5	21.9	62.3	12.3	2.7	-----	-----	-----	-----	3.1	7,233	13,020	2,180	-----	-----
			2	-----	22.7	64.6	12.7	2.8	-----	-----	-----	-----	-----	7,494	13,490	-----	-----	-----
½ mile north of; Hall custom bank, Lower Kittanning bed (face of main entry, 300 feet from mine mouth).	85,355	B	1	3.2	20.0	68.3	8.5	2.4	-----	-----	-----	-----	2.9	7,630	13,750	2,180	-----	-----
			2	-----	20.6	70.6	8.8	2.5	-----	-----	-----	-----	-----	7,894	14,210	-----	-----	-----
Ligonier, 3 miles southeast of; John Dyer mine, Upper Freeport bed (end of workings, 200 feet from mine mouth).	17,901	B	1	2.6	21.4	64.4	11.6	1.9	4.6	75.8	1.3	4.8	1.9	7,428	13,370	2,450	123	-----
			2	-----	22.0	66.1	11.9	2.0	4.5	77.8	1.3	2.5	-----	7,622	13,720	-----	-----	-----
				-----	25.0	75.0	-----	2.3	5.1	88.4	1.5	2.7	-----	8,656	15,580	-----	-----	-----
3 miles north of; Ligonier mine, Pittsburgh bed (face of 3 room, 6 right entry, 950 feet from mine mouth).	1,995	A	1	2.8	22.9	61.6	12.7	1.9	-----	-----	-----	-----	1.9	-----	-----	-----	22	-----
Same (face of 3 room, 4 left butt entry, 800 feet from mine mouth).	1,994	A	1	3.3	23.0	62.5	11.2	1.8	-----	-----	-----	-----	2.4	7,433	13,380	-----	22	-----
			2	-----	23.8	64.6	11.6	1.9	-----	-----	-----	-----	-----	7,683	13,830	-----	-----	-----

Lucesco, ⅜ mile south of; Lucesco mine, Upper Freeport bed (face of 9 left entry, 4,000 feet south of mine mouth).	12,393	A	1	2.9	33.7	50.1	13.3	4.1	-----	-----	-----	-----	1.4	-----	-----	2,000	85	-----
Same (face of 5 left entry, 165 feet beyond 46 room, 3,600 feet from mine mouth).	12,394	A	1	2.9	35.5	52.3	9.3	3.2	-----	-----	-----	-----	1.4	-----	-----	2,140	85	-----
Same (face of 48 room, 1 right entry, 3,200 feet southeast of mine mouth).	12,395	A	1	2.7	36.3	52.0	9.0	2.4	-----	-----	-----	-----	1.1	-----	-----	2,110	85	-----
Same (face of 20 room, 3 right entry, 2,300 feet southeast of mine mouth).	12,396	A	1	2.6	34.8	52.3	10.3	3.0	-----	-----	-----	-----	1.0	-----	-----	2,1[illegible]0	85	-----
Same (composite of samples 12,393 to 12,396 inclusive).	12,397	A	1	2.7	35.7	50.9	10.7	3.1	5.0	72.1	1.2	7.9	1.2	7,278	13,100	-----	85	-----
			2	-----	36.7	52.3	11.0	3.2	4.8	74.1	1.3	5.6	-----	7,483	13,470	-----	-----	-----
			3	-----	41.3	58.7	-----	3.6	5.4	83.3	1.4	6.3	-----	8,404	15,130	-----	-----	-----
Mount Pleasant, 1 mile southwest of; King mine, Redstone bed (face of 3 room, 4 butt entry, 1 left flat entry).	85,328	B	1	1.6	30.8	52.3	15.3	2.8	-----	-----	-----	-----	1.4	6,983	12,570	2,140	-----	-----
Same (face of 2 flat entry, 1 main butt heading)	85,329	B	1	1.6	32.8	55.2	10.4	2.2	-----	-----	-----	-----	1.4	7,444	13,400	2,180	-----	-----
Same (composite of samples 85,328 and 85,329).	85,330	B	1	1.7	31.9	53.6	12.8	2.5	4.8	72.2	1.4	6.3	1.4	7,222	13,000	-----	-----	-----
			2	-----	32.5	54.6	12.9	2.5	4.7	73.5	1.5	4.9	-----	7,350	13,2[illegible]0	-----	-----	-----
			3	-----	37.3	62.7	-----	2.9	5.4	84.4	1.7	5.6	-----	8,439	15,190	-----	-----	-----
Parnassus; Valley Camp No. 3 mine, Upper Freeport bed (25 room, 11 right entry, 4 face main entry).	80,035	B	1	1.7	35.3	54.9	8.1	1.5	5.3	76.4	1.6	7.1	.6	7,633	13,[illegible]50	2,1[illegible]0	-----	-----
			2	-----	35.9	55.9	8.2	1.5	5.2	77.7	1.6	5.8	-----	7,766	13,980	-----	-----	-----
			3	-----	39.2	60.8	-----	1.6	5.7	84.6	1.8	6.3	-----	8,466	15,240	-----	-----	-----
Same Cannel coal.	80,688	B	1	.6	32.0	36.0	31.4	2.2	4.6	57.1	1.2	3.5	.4	5,867	10,560	-----	-----	-----
			2	-----	32.6	36.2	31.6	2.2	4.6	57.5	1.2	2.9	-----	5,906	10,630	-----	-----	-----
			3	-----	47.0	53.0	-----	3.3	6.7	84.0	1.7	4.3	-----	8,628	15,530	-----	-----	-----
Salina, 1 mile northwest of; Apollo No. 1 mine, Upper Freeport bed (right rib of 3 room, 100 feet from 2 left entry, 5 right main entry, 6,000 feet southwest of main mine mouth).	85,680	B	1	2.3	33.7	52.6	11.4	3.1	-----	-----	-----	-----	1.3	7,256	13,060	2,240	-----	-----
Same (right rib of 3 room, 20 feet from 1 left entry, 5 right main entry).	85,681	B	1	2.7	35.1	54.5	7.7	3.5	-----	-----	-----	-----	1.6	7,556	13,600	2,160	-----	-----
Same (composite of samples 85,680 and 85,681).	85,682	B	1	2.5	34.6	53.5	9.4	3.4	5.2	73.5	1.3	7.2	1.4	7,394	13,310	-----	-----	-----
			2	-----	35.5	54.9	9.6	3.4	5.1	75.4	1.3	5.2	-----	7,583	13,650	-----	-----	-----
			3	-----	39.3	60.7	-----	3.8	5.6	83.4	1.5	5.7	-----	8,391	15,110	-----	-----	-----
Apollo No. 2 mine, Lower Kittanning bed (face of 4 left heading, 1 left face heading, 1,500 feet south of mine mouth).	85,676	B	1	2.8	35.7	54.0	7.5	2.7	-----	-----	-----	-----	2.0	7,639	13,750	2,240	-----	-----
Same (face of 8 right heading, main heading, 3,000 feet southwest of mine mouth).	85,677	B	1	2.5	36.1	53.0	8.4	3.1	-----	-----	-----	-----	1.8	7,572	13,630	2,280	-----	-----
Same (face of 5 room, 1 right heading, main heading).	85,678	B	1	2.6	36.5	53.3	7.6	2.3	-----	-----	-----	-----	1.9	7,661	13,790	2,560	-----	-----
Same (composite of samples 85,676 to 85,678 inclusive).	86,679	B	1	2.7	35.8	53.8	7.7	2.6	5.4	75.8	1.3	7.2	1.9	7,638	13,780	-----	-----	-----
			2	-----	36.8	55.3	7.9	2.7	5.2	77.9	1.4	4.9	-----	7,839	14,110	-----	-----	-----
			3	-----	40.0	60.0	-----	2.9	5.6	84.6	1.5	5.4	-----	8,503	15,310	-----	-----	-----
Seward, 1½ miles east of; Seward mine, Lower Kittanning bed (1,850 feet south of mine mouth).	4,349	A	1	2.8	17.9	71.3	8.0	2.3	-----	-----	-----	-----	2.3	-----	-----	-----	22	-----
Same (1,050 feet southwest of mine mouth).	4,350	A	1	2.5	17.9	70.4	9.2	3.0	-----	-----	-----	-----	2.0	7,678	13,820	-----	22	-----
			2	-----	18.3	72.2	9.5	3.1	-----	-----	-----	-----	-----	7,872	14,170	-----	-----	-----

*, †, ‡, §, ¶, See footnote page 17.

Analyses of mine samples—Continued

Locality, mine, coal bed, etc.	Sample.			Proximate.				Ultimate.					Air-drying loss.	Calorific value.		Softening temp. °F.§	References.¶	
	Laboratory No.*	Kind.†	Condition.‡	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Hydrogen.	Carbon.	Nitrogen.	Oxygen.		Calories.	British thermal units.		Bull. No.	Page No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
WESTMORELAND COUNTY—Continued																		
Slickville, ½ mile north of; Frank Rugh mine, Pittsburgh bed (face of heading, 300 yds. from mine mouth).	83,660	B	1	3.6	32.3	56.2	7.9	1.4	-----	-----	-----	-----	2.7	7,456	13,420	2,510	-----	-----
Same (room neck, main entry, 300 yds. from mine mouth).	83,661	A	1	3.2	32.9	55.2	8.7	1.2	-----	-----	-----	-----	2.3	7,433	13,380	2,570	-----	-----
Same (composite of samples 83,660 and 83,661).	83,662	B	1	3.4	33.0	55.2	8.4	1.4	5.2	74.9	1.5	8.6	2.5	7,439	13,390	-----	-----	-----
			2	-----	34.2	57.1	8.7	1.5	5.0	77.5	1.6	5.7	-----	7,700	13,860	-----	-----	-----
			3	-----	37.4	62.6	-----	1.6	5.5	84.8	1.7	6.4	-----	8,433	15,180	-----	-----	-----
¾ mile southwest of; Edwards mine, Pittsburgh bed (face of room, 2 left heading).	83,657	B	1	3.3	32.6	55.6	8.5	1.0	-----	-----	-----	-----	2.4	7,417	13,350	2,680	-----	-----
Same (on rib of room, 2 left heading).	83,658	B	1	3.5	33.1	55.8	7.6	1.2	-----	-----	-----	-----	2.7	7,472	13,450	2,620	-----	-----
Same (composite of samples 83,657 and 83,658).	83,659	B	1	3.4	33.2	55.4	8.0	1.2	5.3	75.1	1.6	8.8	2.6	7,456	13,420	-----	-----	-----
				-----	34.3	57.4	8.3	1.3	5.1	77.8	1.6	5.9	-----	7,717	13,890	-----	-----	-----
				-----	37.4	62.6	-----	1.4	5.6	84.8	1.8	6.4	-----	8,417	15,150	-----	-----	-----
Smithton, ¾ mile northeast of; Liberty mine, Redstone bed (face of 1 right butt heading, main heading).	85,322	B	1	1.9	33.1	53.6	11.4	2.1	-----	-----	-----	-----	1.4	7,283	13,110	2,240	-----	-----
Same (face of main heading).	85,323	B	1	2.5	33.6	55.3	8.6	1.8	-----	-----	-----	-----	1.8	7,456	13,420	2,280	-----	-----
Same (composite of samples 85,322 and 85,323).	85,324	B	1	2.2	33.3	54.6	9.9	1.9	5.2	73.2	1.6	7.5	1.6	7,367	13,260	-----	-----	-----
			2	-----	34.0	55.9	10.1	2.0	5.0	75.6	1.7	5.6	-----	7,539	13,570	-----	-----	-----
			3	-----	37.9	62.1	-----	2.2	5.6	84.1	1.8	6.3	-----	8,383	15,090	-----	-----	-----
Swede Hill, ¼ mile south of; Hill Top mine, Redstone bed (face of 1 right butt entry, 1 left entry, 200 yds. north of mine mouth).	81,069	B	1	1.7	33.4	50.3	14.6	3.5	-----	-----	-----	-----	1.1	7,000	12,600	-----	-----	-----
Same (face of 1 right entry, 200 yds. north of mine mouth)	81,070	B	1	2.3	32.2	50.9	14.6	3.4	-----	-----	-----	-----	1.6	6,889	12,400	2,130	-----	-----
Same (composite of samples, 81,069 and 81,070).	81,071	B	1	2.1	32.1	51.1	14.7	3.4	5.0	69.3	1.4	6.2	1.3	6,983	12,570	-----	-----	-----
			2	-----	32.8	52.2	15.0	3.5	4.9	70.8	1.5	4.3	-----	7,133	12,840	-----	-----	-----
			3	-----	38.5	61.5	-----	4.1	5.7	83.2	1.7	5.2	-----	8,389	15,100	-----	-----	-----

SAMPLES OF PENNSYLVANIA COALS

Following are field notes taken while sampling the various coals given in the tables. Analyses will be found on pages referred to in parentheses. Most of these samples were collected for the Pennsylvania Geological Survey by Erle G. Hill, L. D. Woodworth, and J. D. Sisler. Initials in parentheses following the names of other collectors indicate their affiliation. All coal is bituminous, and all mines are operated by the room and pillar system unless stated otherwise. The word sulphur used in the following sections means some form of iron pyrite, and slate is a coal miner's term for hard shale or bony coal.

ALLEGHENY COUNTY

CURTISVILLE. NO. 1 OR BENJAMIN MINE

Analysis 83115 (p. 18). A shaft mine of Ford Collieries Co., Upper Freeport coal. Roof, cannel coal; floor, fireclay. Sampled in August, 1921, by L. A. Faustino (USGS).

Sections of coal bed in No. 1 mine

Laboratory No.	83115			83114	
	Ft.	in.		Ft.	in.
Lower bench:			Upper bench:		
Coal	2	5½	Coal	2	4
Shale*		1½	Bony coal		
Coal		3½	and shale	1	6
Shale*		1¼			
Coal		2¼			
Thickness of bed	7	0			
Thickness of sample	2	5½		2	4

*Not included in sample.

EAST PITTSBURGH. CRESTAS MINE

Analyses 85902 to 85904 (p. 18). A drift mine, 1100 feet above sea level, 1 mile south of East Pittsburgh on the P. R. R. A wagon mine. Redstone coal. Dip, southeast; strike northeast. Roof, shale; floor, shale. Sampled at two points by L. D. Woodworth on May 27, 1922.

Sections of coal bed in Crestas mine

Section	A		B	
Laboratory No.	85902		85903	
	Ft.	in.	Ft.	in.
Bony coal*		1		1
Coal		4		3
Shale*		½		½
Coal	2	10		8
Shale				¼
Coal			2	6
Thickness of bed	3	3½	3	6¾
Thickness of sample	3	2	3	5¼

*Not included in sample

Coal cut by hand; permissible explosives are used. At the time of sampling the daily output was 20 tons, all from advance workings. All coal was run-of-mine, and coal is picked on car. In 1922 the life of mine was estimated to be 15 years.

GLENSHAW. PORTER COAL BANK

Analysis 83124 (p. 19). Upper Freeport coal. Roof, bony coal; floor, fireclay. Sampled by L. A. Faustino (USGS) in August, 1921.

Section of coal bed at Porter coal bank

Laboratory No.	83124	
	Ft.	in.
Coal	2	11
Shale		¾
Coal		4
Fireclay		
Thickness of bed	3	3¾
Thickness of sample	2	11

HARMARVILLE. HARMAR MINE

Analysis 83123 (p. 19). Upper Freeport coal. Roof, shale; floor, fireclay. Sampled by L. A. Faustino (USGS) in August, 1921.

Section of coal bed in Harmar mine.

Laboratory No.	83123	
	Ft.	in.
Coal, upper bench*	3	3½
Bony coal		11½
Coal, lower bench*	3	¼
Shale		½
Coal		3½
Shale		1
Coal		3
Fireclay		
Thickness of bed	7	11¼
Thickness of sample	6	3¾

*Included in sample.

INDIANOLA. INLAND MINE

Analyses 83121 and 83122 (p. 19). Inland Collieries Co. mine, at Indianola. Upper Freeport coal. Sampled by L. A. Faustino (USGS) in August, 1921

Section of coal bed in Inland mine

	Ft.	in.
Clean coal (83121)	3	1
Bony coal		10½
Clean coal (83122)	3	1
Shale		½
Coal		4
Shale		1
Coal		2½
Fireclay		
Thickness of bed	7	8½
Thickness of two samples	6	2

This is a new shaft mine about 190 feet deep. A modified room-and-pillar method of mining is employed. The extraction is high, the pillar coal being mined on the retreat. The coal is undercut with machines and shot down with permissible explosives. The daily production was about 2,000 tons, but provision was made in development plans to hoist 2,500 to 3,500 tons daily. About one-sixth of the coal is washed. The tipple is equipped with picking tables, screens, and crushers. The coal is used exclusively for by-product coking.

LINCOLN PLACE. KOEHLER MINE

Analyses 85960 to 85962 (p. 19). A drift mine, about 1,000 feet above sea level, ½ mile southeast of Lincoln Place. Pittsburgh coal. Dip, northwest; strike, northeast. Sampled at two points by L. D. Woodworth on May 31, 1922.

Sections of coal bed in Koehler mine

Section	A		B	
Laboratory No.	85960		85961	
	Ft.	in.	Ft.	in.
Coal		3	1	7
Shale		¼	—	—
Bony coal*	—	—		½
Coal	1	4	1	6
Mother coal		¼	—	—
Shale	—	—		¼
Coal		11		4
Mother coal		¼	—	—
Shale*	—	—		½
Coal		7	2	0
Shale*		½	—	—
Coal		5	—	—
Shale*		1	—	—
Coal	2	0	—	—
Thickness of bed	5	8¼	5	6¼
Thickness of sample	5	6¾	5	5

*Not included in sample.

Coal was hand cut, and black blasting powder was used. At the time of sampling the daily output was 10 tons per day, all from advance workings. All coal was run-of-mine. In 1922 the life of mine was estimated to be 5 years.

LOGANS FERRY. FARNETH MINE

Analysis 83117 (p. 19). Pittsburgh coal. Bed is 8 feet 6 inches thick.

The sample represents 44⅛ inches constituting the main or upper bench of the bed. The lower part is not mined on account of water. Coal is brown, and apparently weathered.

Sampled by L. A. Faustino (USGS) in August, 1921.

McKEESPORT, UNION VALLEY NO. 2 MINE

Analyses 82396 to 82398 (p. 19). A drift mine of Union Valley Coal Co., 4 miles east of McKeesport. Pittsburgh coal. Sampled at two points by E. G. Hill on October 21, 1921.

Section of coal bed in Union Valley No. 2 mine

Section	A		B	
Laboratory No.	82396		82397	
	Ft.	in.	Ft.	in.
Roof, coal	—	—	—	—
Coal	3	7	3	5
Parting		¼		¼
Coal		5		5
Parting		½	*	¾
Coal	2	3	2	1
Floor, limestone	—	—	—	—
Thickness of bed	6	3¾	6	0
Thickness of sample	6	3¾	5	11¼

*Not included in sample.

Coal was undercut by hand, and black blasting powder was used. At the time of sampling the output was 200 tons per day, all run-of-mine. In 1921 the life of mine was estimated to be 3 years.

NATRONA. NO. 1 NATRONA MINE

Analyses 85869 to 85872 (p. 19). A drift mine 812 feet above sea level at Natrona on the P. R. R. Upper Freeport coal. Dip, 1 per cent to southeast; strike, northeast. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on May 23, 1922.

Sections of coal bed in No. 1 Natrona mine

Section	A		B		C	
Laboratory No.	85869		85870		85871	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		9		9		9
Coal	3	2	3	1		5
Bony coal*		½	---	---	---	---
Shale	---	---		½*		¼
Coal		4		3	1	3
Bony streaked coal*		6		6		
Sulphur	---	---	---	---		¼
Coal	---	---	---	---	1	1
Shale	---	---	---	---		⅛
Coal	---	---	---	---		4½
Bony coal*	---	---	---	---		½
Coal	---	---	---	---		3½
Bony coal*	---	---	---	---		1
Coal	---	---	---	---		5
Bony streaked coal*	---	---	---	---		5
Thickness of bed	4	9½	4	7½	5	2⅛
Thickness of sample	3	6	3	4	3	10⅝

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 600 tons, 90 per cent from advance workings. All coal was run-of-mine, and coal was picked on car. In 1922 the life of mine was estimated to be 50 years.

NORTH BESSEMER. NEW FIELDS NO. 1 MINE

Analyses 32255, 32256, 32257 (comp.); 32258, 32259, 32260, (p. 17). From No. 1 mine of New Fields By-Product Coal Co., at Campbell Station on the Plum Creek Branch of Valley Division of the P. R. R. Opened by two shafts about 300 feet deep, one for men and material, the other the main hoisting shaft. Elevation of bottom of coal at foot of shaft is 585.6 feet. Upper Freeport coal. Roof and floor are of slate. Cover at point of sampling is 300 feet. The bed was measured and sampled at four points by L. D. Tracy (USBM) on July 2, 1919.

Sections of coal bed in New Fields No. 1 mine

Section	A		B		C		D		E	
Laboratory No.	32255		32256		32258		32259		32260	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Sulphur or rock coal*	---	---	---	---		7	1	2		7
Coal	3	5*	3	5	2	8	2	10	2	8*
Bone coal or bone*	1	3	1	3	1	2		7	1	2
Coal	3	9	3	9*	4	0	3	5	4	0*
Slate*		1		1		½		¾		½
Bottom coal		8		8*		8		8		8*
Thickness of bed	9	2	9	2	9	1½	8	8¾	9	1½
Thickness of sample	4	5	3	5	7	4	6	11	1	2

*Not included in sample.

The work consisted principally of driving entries for development purposes. Coal is all undercut; eight 35 B open-type 250-volt, direct current, chain machines are operated. The undercut is made as close to bottom as possible. The bottom coal remaining after the machine cuts, is taken up and loaded. The shaft bottom

is equipped with an automatic caging device, and all material, slate and men are hoisted from the auxiliary shaft. Tipple is of steel, equipped with a self-dumping cage. There were 95 men employed underground, and 60 above. At the time of sampling the output was 700 tons per day; 10 per cent of coal was run-of-mine. After passing over the ¾-inch screens, the coal goes to a picking table where all impurities are removed by 5 men. Electric haulage motors are used exclusively both for gathering and for the main haulage. The road bed is laid with 30 and 55-lb. rails resting on 4 by 6-inch ties. About 150 wooden cars, with tight end gates, are used. These cars are unusually large, weighing about 3400 lbs., and hold from 7000 to 8000 lbs. of coal. The life of mine in 1919 was estimated to be 25 years.

Analyses 83118 and 83119 (p. 19). Roof, shale; floor, fireclay. Sampled by L. A. Faustino (USGS) in August, 1921.

Section of coal bed in New Fields No. 1 mine

	Ft.	in.
Coal (83118)	3	3
Bony coal	1	0
Coal (83119)	3	1
Shale		½
Coal		4
Shale		1
Coal		2½
Fireclay		
Thickness of bed	8	0

PETERSON STATION. PETERSON MINE

Analysis 85841, (p. 20). A drift mine 75 feet above Allegheny River, at Peterson Station, on P. R. R. Upper Freeport coal. Dip, southeast at low angle; strike, northeast. Mine is where Upper Freeport changes from thin to thick coming down Allegheny. Upper bench is dirty and is left up in rooms, taken down only to make height for haulage. Roof, shale; and floor, fireclay. Sampled by L. D. Woodworth on May 24, 1922.

Section of coal bed in Peterson mine.

Laboratory No.	85841	
	Ft.	in.
Cannel coal*	1	0
Coal streaked with bone and sulphur*	2	0
Shale*	1	0
Bony streaked coal*	1	2
Coal	2	6
Bony coal*		½
Coal		6
Thickness of bed	8	2½
Thickness of sample	3	0

*Not included in sample.

Coal is undercut by machines, and permissible explosives are used. All coal is run-of-mine, and coal is picked on car. Mine was in bad condition due to idleness, and only one sample could be obtained. In 1922 the life of mine was estimated to be 5 years.

PITTSBURGH. SMITH MINE

Analyses 85816 to 85818 (p. 20). A drift mine of the Elsie Coal Co., about 1175 feet above sea level, 6 miles east of Pittsburgh at end of Lincoln car line, Pittsburgh coal. Dip, northwest at low angle; strike northeast. Roof, shale; and floor, fireclay. Sample at two points by L. D. Woodworth on May 19, 1922.

Sections of coal bed in Smith mine

Section	A		B	
Laboratory No.	85816		85817	
	Ft.	in.	Ft.	in.
Coal	3	4	1	10
Shale		¼		¼
Coal		5		8
Shale		¼		¼
Coal		10		8
Shale		¼		¼
Coal	1	2		5
Shale*				½
Coal			1	2
Shale				¼
Coal			1	4
Thickness of bed	5	9¾	6	2½
Thickness of sample	5	9¾	6	2

*Not included in sample.

Coal is undercut by hand, and no explosives were used. At the time of sampling the daily output was 40 tons. All coal was run-of-mine. In 1922 the life of mine was estimated at 2 years.

SCOTT HAVEN. SCOTT HAVEN MINE

Analyses 82399 to 82402 (p. 20). A drift mine 840 feet above sea level, ¼ mile south of Scott Haven on the P. & L. E. R. R. Redstone coal. Roof, shale; floor, fireclay. Sampled at three points by E. G. Hill on October 22, 1921.

Sections of coal bed in Scott Haven mine

Section	A		B		C	
Laboratory No.	82399		82400		82401	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	3	6	2	10	4	5
Bottom coal				3		
Bone or bony coal*		6		1		
Thickness of bed	4	0	3	2	4	5
Thickness of sample	3	6	3	1	4	5

*Not included in sample.

Coal is undercut by machine; black blasting powder is used. At the time of sampling the daily output was 50 tons. All coal is run-of-mine. In 1921 the life of mine was estimated to be 6 years.

SPRINGDALE. SPRINGDALE MINE

Analyses 85873 to 85877 (p. 20). A shaft mine 120 feet deep, 772 feet above sea level, ½ mile northeast of Springdale on P. R. R. Upper Freeport coal. Dip, southeast; and strike, northeast. Roof, shale; floor, fireclay. Measured at four points by L. D. Woodworth on May 25, 1922.

Sections of coal bed in Springdale mine

Section	A		B		C		D	
Laboratory No.	85873		85874		85875		85876	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Cannel coal*	1	0	1	0	1	0	1	0
Coal	1	10	1	11	1	9	2	1
Bony coal*		10	1	0	1	0		11
Coal	3	3		9	1	5	1	2
Bony coal*		½	----	----	----	----	----	----
Shale	----	----		½*		¼		½
Coal		4	2	6	1	5	1	5
Bony coal	*	½	----	----		¼	----	----
Shale	----	----		¼	----	----		¼
Coal		7		3		4	1	1
Bony coal*	----	----		1	----	----		½
Shale	----	----	----	----		¼	----	----
Coal	----	----		5		4		7
Bony coal*	----	----	----	----		1½	----	----
Coal	----	----	----	----		6	----	----
Thickness of bed	7	11	7	11¾	7	11¼	8	4¼
Thickness of sample	6	0	5	10¼	5	9¾	6	4¼

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At time of sampling the daily output was 800 tons, all coal being derived from advance workings. (In 1924 the output was over 2,000 tons daily.) All coal is run-of-mine. In 1922 the life of mine was estimated to be 75 years. A high extraction is obtained.

TURTLE CREEK. HERALD AND BOWERS MINE

Analyses 82221 to 82223 (p. 21). A drift mine at Turtle Creek, on P. R. R. Pittsburgh coal. Roof, slate; floor, fireclay. Measured at two points by E. G. Hill, on October 7, 1921.

Scetions of coal bed in Hearld and Bowers mine

Section	A		B	
Laboratory No.	82221		82222	
	Ft.	in.	Ft.	in.
Coal	3	6	3	7
Parting		½		½
Coal		5		4
Parting		¼		¼
Coal	2	0	2	2
Thickness of bed	5	11¾	6	1¾
Thickness of sample	5	11¾	6	1¾

Coal was undercut by hand. At the time of sampling the daily output was 100 tons, all from advance workings. Sizes produced, lump and slack. In 1921 the life of mine was estimated to be 5 years.

UNIVERSAL. MORANINA MINE

Analyses 85899 to 85901 (p. 21). A drift mine about 1100 feet above sea level, 1 mile south of Universal, on the P. & L. E. R. R. Pittsburgh coal. Dip, southeast; and strike, northeast. Roof, shale; and floor, soft clay. Measured at two points by L. D. Woodworth on May 29, 1922.

Sections of coal bed in Moranina mine

Section	A		B	
Laboratory No.	85899		85900	
	Ft.	in.	Ft.	in.
Coal		10	----	----
Shale or bony coal		¼		2*
Coal	1	6		8
Mother coal		½*		¼
Coal		7		10
Shale		¼		⅛
Coal		6		11
Shale		¼		⅛
Coal		4		10
Shale		½*		¼
Coal	1	0		6
Shale		¼		1*
Coal	1	0		7
Floor coal*	----	----	1	0
Thickness of bed	5	11	5	7¾
Thickness of sample	5	10	4	4¾

*Not included in sample.

Coal was undercut by hand, and no explosives were used. All coal is run-of-mine. The mine was idle at the time of sampling. In 1922 the life of mine was estimated at 1½ years.

WEST ELIZABETH. ROWLANDS MINE

Analyses 85963 to 85965 (p. 21). A custom bank about 1,000 feet above sea level at West Elizabeth on the P. R. R. Redstone coal. Dip, southeast; strike, northeast. Roof, shale; floor, fireclay. Sampled at two points by L. D. Woodworth on May 30, 1922.

Sections of coal bed in Rowlands mine

Section	A		B	
Laboratory No.	85963		85964	
	Ft.	in.	Ft.	in.
Coal	1	7	2	7
Shale		¼		½
Coal	1	3		5
Shale		¼	----	----
Coal		3	----	----
Thickness of bed	3	1½	3	½
Thickness of sample	3	1½	3	0

Coal is undercut by hand, and no explosives are used. All coal is from advance workings; and 100 per cent is run-of-mine. At the time of sampling the daily output was 10 tons. In 1922 the life of mine was estimated to be 5 years.

ARMSTRONG COUNTY

AVONMORE. AVONMORE MINE

Analyses 85661 to 85663 (p. 21). A drift mine 1129.33 feet above sea level, ½ mile east of Avonmore, on the P. R. R. Pittsburgh coal. Dip, SE.; strike, N. 22°E. Roof and floor are of shale. Sampled at two points by L. D. Woodworth on May 5, 1922.

Sections of coal bed in Avonmore mine

Section	A		B	
Laboratory No.	85661		85662	
	Ft.	in.	Ft.	in.
Rooster coal (not mined)*	1	2	1	2
Clay*		2		3
Coal	2	10	2	1
Shale		¼		4*
Coal		7		10
Shale*		1		½
Coal	1	1		5
Shale*		4		1
Coal		4		10
Coal and shale*				5
Shale*				4
Coal			1	5
Shale				½*
Coal				3
Thickness of bed	6	7¼	8	6
Thickness of sample	5	10¼	5	10

*Not included in sample.

Coal is undercut with machines and black blasting powder used. At the time of sampling the daily output was 150 tons, 75 per cent from advance workings. All coal is run-of-mine, and coal is picked on car. In 1922 the life of mine was estimated to be 12 years.

CADOGAN. DOVER MINE

Analyses 83364 to 83367 (p. 21). A drift mine, 100 feet above station at and ½ mile south of Cadogan, on the P. & S. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 13, 1921.

Sections of coal bed in Dover mine

Section	A		B		C	
Laboratory No.	83364		83365		83366	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	10	1	10	2	9
Slate		¼		¼		½
Coal		7		8		9½
Slate		¼				
Sulphur*				½		
Bony coal*						5
Coal		5		3		
Bony coal*		5				
Sulphur				¼		
Coal				6		
Bony coal*				4		
Thickness of bed	3	3½	3	8	4	0
Thickness of sample	2	10½	3	3½	3	6½

*Not included in sample.

Coal is undercut by machines and permissible explosives are used. At the time of sampling the daily output was 150 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 15 years.

CHICKASAW. No. 1 CHICKASAW MINE

Analyses 83492 to 83496 (p. 22). A drift mine 30 feet above station at Chickasaw on P. & S. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Sampled at four points by L. D. Woodworth on December 14, 1921.

Sections of coal bed in No. 1 Chickasaw mine

Section	A		B		C		D	
Laboratory	83492		83493		83494		83495	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		3		2		6		
Coal		10		10		8		10
Coal (trifle bony)		4						
Bony coal*				1		1		1
Coal	1	3	2	11	2	9	2	11
Sulphur*		2						
Coal	1	5						
Sulphur*		½						
Coal		5						
Thickness of bed	4	8½	4	0	4	0	3	10
Thickness of sample	4	3	3	9	3	5	3	9

*Not included in sample.

Coal is undercut by machines, and black blasting powder used. At the time of sampling the daily output was 1400 tons, 80 per cent from advance workings; 90 per cent of coal is run-of-mine. Coal is screened on ¾-inch screens, and picked on car. In 1921 the life of mine was estimated to be 50 years.

COWANSHANNOCK. No. 3 DOMINION MINE

Analyses 83571 to 83574 (p. 22). A drift mine 150 feet above and ½ mile north of Cowanshannock on the P. R. R. Lower Kittanning coal. Roof, sand rock; floor, fireclay. Sampled at three points by L. D. Woodworth on December 30, 1921.

Sections of coal bed in No. 3 Dominion mine

Section	A		B		C	
Laboratory No.	83571		83572		83573	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	*	1		5½		6
Sulphur*		½		½		
Bony coal*						½
Coal		6	1	3	1	5
Bony coal*		½				
Sulphur*				½		½
Coal	2	0		11		10
Bottom coal*		4				
Thickness of bed	3	0	2	8½	2	10
Thickness of sample	2	6	2	7½	2	9

*Not included in sample.

Coal is undercut by machine and black blasting powder used. At the time of sampling the daily output was 150 tons. All coal is run-of-mine. Coal is picked on car.

DAYTON. No. 3 HOLLOW MINE

Analyses 81579 to 81582 (p. 22). A drift mine 1280 feet above sea level, ½ mile east of Dayton, on the B. R. & P. R. R. Upper Freeport coal. Slight dip to south. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on September 14, 1921.

Sections of coal bed in No. 3 Hollow mine

Section	A		B		C	
Laboratory No.	81579		81580		81581	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	1	2	1	0	----	----
Coal	1	7	2	11	1	3
Sulphur		½*	----	----		⅛
Coal	2	3	----	----	2	3
Thickness of bed	5	½	3	11	3	6⅛
Thickness of sample	3	10	2	11	3	6⅛

*Not included in sample.

The coal is undercut by machine, and black blasting powder used. At the time of sampling the daily output was 300 tons, 75 per cent from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated at 10 years.

DICKEY STATION. PINE CREEK MINE

Analyses 83488 to 83491 (p. 22). A drift mine 60 feet above Dickey station on the P. & S. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 16, 1921.

Section of coal bed in Pine Creek mine

Section	A		B		C	
Laboratory No.	83488		83489		83490	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		3	----	----	----	----
Sulphur*		1	----	----	----	----
Coal		6	----	----	----	----
Bony coal*		½	----	----		8
Coal	1	3		6½	1	1
Sulphur*		1		½		1
Coal	2	1	3	6	1	10
Thickness of bed	4	3½	4	1	3	8
Thickness of sample	4	1	4	½	2	11

*Not included in sample.

Coal was undercut by hand, and black blasting powder used. At the time of sampling the daily output was 75 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 15 years.

EDDYVILLE. EAGLE MINE

Analyses 83317 to 83320 (p. 23). A drift mine 150 feet above and ¼ mile north of Eddyville on P. & S. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Measured at three points by L. D. Woodworth on December 7, 1921.

Sections of coal bed in Eagle mine

Section	A		B		C	
Laboratory No.	83317		83318		83319	
	Ft.	in.	Ft.	in.	Ft.	in.
Sulphur and sulphur coal*		4		2		3
Coal		5		6		4
Bony coal*		½		½		½
Coaal	2	8	2	6	2	3
Thickness of bed	3	5½	3	2½	2	10½
Thickness of sample	3	1	3	0	2	7

*Not included in sample.

Coal is undercut by hand, and black blasting powder used. At the time of sampling the daily output was 100 tons, all from advance workings. All coal is run-of-mine. Coal is picked on car. In 1921 the life of mine was estimated as 10 years. The property consisted of 174 acres of coal.

FREEPORT. CENTURY No. 2 MINE

Analyses 83564 to 83567 (p. 23). A drift mine 150 feet above and one mile north of Freeport on the P. R. R. Upper Freeport coal. Roof, sandstone; floor, fireclay. Sampled at three points by L. D. Woodworth on December 29, 1921.

Section of coal in Century No. 2 mine

Section	A		B		C	
Laboratory No.	83564		83565		83566	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		3		3		2
Coal		2				
Slate		¼				
Coal	2	8	2	8	2	9
Slate*		1		½		½
Coal*		4		4		3
Thickness of bed	3	6¼	3	3½	3	2½
Thickness of sample	2	10¼	2	8	2	9

*Not included in sample.

Coal is undercut by machine, and black blasting powder used. At the time of sampling the daily output was 300 tons, from advance workings. All coal is run-of-mine. Coal is picked on table. In 1921 the life of mine was estimated to be 20 years, the area of coal being 200 acres.

FREEPORT. No. 3 CENTURY MINE

Analyses 83568 to 83570 (p. 23). A drift mine 150 feet above and 1½ miles north of Freeport, on the P. R. R. Upper Freeport coal. Roof, sandstone; floor, fireclay. Measured and sampled at two points by L. D. Woodworth on December 29, 1921.

Sections of coal in No. 3 Century mine

Section	A		B	
Laboratory No.	83568		83569	
	Ft.	in.	Ft.	in.
Coal	1	6		5
Mother coal		¼		
Slate				¼
Coal				5½
Mother coal*				½
Coal	1	0	1	7
Slate*		½		½
Coal		5		6
Thickness of bed	2	11¾	3	¾
Thickness of sample	2	11¼	2	11¾

*Not included in sample.

Coal is undercut by machine, and black blasting powder used. All coal is run-of-mine, from advance workings. Picking tables are used. In 1921 the life of mine was estimated at 30 years.

FRIEDENHEIM. LEET No. 1 MINE

Analyses 83484 to 83487 (p. 23). A drift mine, 150 feet above and ½ mile west of Friedenheim, on the P. & S. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 16, 1921.

Sections of coal bed in Leet No. 1 mine

Section	A		B		C	
Laboratory No.	83484		83485		83486	
	Ft.	in.	Ft.	in.	Ft.	in.
Dirty coal*		4		3		6½
Coal		5		2		6
Bony coal*		½	—	—		1
Sulphur*	—	—		1	—	—
Coal	1	3	1	5	3	0
Sulphur*		½	—	—		1
Bony coal	—	—		¼	—	—
Coal	1	4	1	5		3
Thickness of bed	3	5	3	4¼	4	5½
Thickness of sample	3	0	3	¼	3	9

*Not included in coal bed.

Coal is undercut by machine, and black blasting powder used. At the time of sampling the daily output was 200 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 20 years. The coal area was 300 acres.

FURNACE RUN. NO. 1 FURNACE RUN MINE

Analyses 83506 to 83509 (p. 23). 972 feet above sea level, at Furnace Run on the P. & S. R. R. Lower Kittanning coal. General dip to southwest. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 21, 1921.

Sections of coal bed in No. 1 Furance Run mine

Section	A		B		C	
Laboratory No.	83506		83507		83508	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	—	—		1	—	—
Coal		10		9½		10
Bony coal*		¼		½		½
Coal	2	8½	2	6	2	0
Sulphur and coal*	—	—	—	—		4
Thickness of bed	3	6¾	3	5	3	2½
Thickness of sample	3	6½	3	3½	2	10

*Not included in sample.

Coal is undercut by machine, and shot down with both black powder and permissible explosives. At the time of sampling, the daily output was 1100 tons, 70 per cent from advance workings. Coal is picked on car; 97 per cent was run-of-mine. In 1921 the life of mine was estimated to be 20 years.

FURNACE RUN. No. 6 FURNACE RUN MINE

Analyses 83502 to 83505 (p. 24). 972 feet above sea level at Furance Run on the P. & S. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. measured and sampled at three points by L. D. Woodworth on December 20, 1921.

Sections of coal in No. 6 Furnace mine

Section	A		B		C	
Laboratory No.	83502		83503		83504	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		9		9		8
Sulphur*		1				½
Bony coal*				½		1½
Coal	2	7	2	7	2	5
Thickness of bed	3	5	3	4½	3	3
Thickness of sample	3	4	3	4	3	1

*Not included in sample.

Coal is undercut by machine, and black blasting powder and permissible explosives are used. At the time of sampling the daily output was 1100 tons, 97 per cent being run-of-mine and 70 per cent from advance workings. Coal is picked on cars. In 1921 the life of mine was estimated to be 20 years.

GODFREY STATION. MAJESTIC No. 1 MINE

Analyses 83654 to 83656 (p. 24). A drift mine, 125 feet above Godfrey Station, on the P. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at two points by L. D. Woodworth on January 6, 1922.

Sections of coal bed in Majestic No. 1 mine

Section	A		B	
Laboratory No.	83654		83655	
	Ft.	in.	Ft.	in.
Coal	2	7	2	5
Slate*		½		½
Coal		4		6½
Thickness of bed	2	11½	3	0
Thickness of sample	2	11	2	11½

*Not included in sample.

Coal is undercut by machine, and shot down with black blasting powder. At the time of sampling the daily output was 50 tons, all from advance workings. All coal was run-of-mine, and was picked on car. Only part of mine was being worked. In 1922 the life of mine was estimated to be 10 years.

JOHNETTA. JOHNETTA SHAFT MINE

Analyses 83595 to 83598 (p. 24). Above station at Johnetta on P. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on January 3, 1922.

Sections of coal bed in Johnetta shaft mine

Section	A		B		C	
Laboratory No.	83595		83596		83597	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		5		6		6
Coal	2	11	1	1	1	0
Sulphur*		1		½		
Bony coal*						1
Coal		8		2	2	2
Sulphur*				1		
Coal			2	5		
Thickness of bed	4	1	4	3½	3	9
Thickness of sample	3	7	3	8	3	2

*Not included in sample.

Coal is undercut by machine and permissible explosives are used. At the time of sampling the daily output was 425 tons, all from advance workings. All coal was run-of-mine, and was picked on car. About 33 per cent of coal mined is consumed by brickworks; it is a fireclay mine in conjunction with coal mine. In 1922 the life of mine was estimated to be 20 years.

KELLY STATION. BENSON MINE

Analyses 83627 to 83629 (p. 24). A drift mine 825 feet above sea level, at Kelly Station on the P. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Sampled at two points by L. D. Woodworth on January 5, 1922.

Sections of coal bed in Benson mine

Section	A		B	
Laboratory No.	83627		83628	
	Ft.	in.	Ft.	in.
Coal		5½		5
Slate*		½		½
Coal		3½		[illegible]
Slate*	1	2	1	0
Coal		3		
Mother coal*		½		
Coal	2	0	2	4
Thickness of bed	4	3	4	1½
Thickness of sample	3	0	3	1

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 100 tons, all from advance workings. All coal was run-of-mine, and coal was picked on car. The mine was recently opened, and in 1922 its life was estimated to be 5 years.

KELLY STATION. No. 2 PROVIDENT MINE

Analyses 83623 to 83626 (p. 25). A drift mine 875 feet above sea level at Kelly Station, on the P. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on January 4, 1922.

Sections of coal bed in Provident No. 2 mine

Section	A		B		C	
Laboratory No.	83623		83624		83625	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		7		7		7
Coal	1	6	1	3½	2	3
Sulphur	*	1		¼		
Slate*						1
Coal		4		9		2
Slate*		1		1½		
Mother coal*						½
Coal		7		7		6
Slate*		1		1		½
Coal		3		3		4
Thickness of bed	3	6	3	8¼	4	0
Thickness of sample	2	8	2	10¾	3	3

*Not included in sample.

Coal is undercut by machine, and black blasting powder used. At the time of sampling the daily output was 300 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. The area of coal was 3500 acres, and in 1922 the life of mine was estimated to be 60 years.

KITTANNING. BAXTER MINE

Analyses 83166 to 83169 (p. 25). A drift mine 30 feet above station at Kittanning on the P. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Sampled in three places by L. D. Woodworth on November 30, 1921.

Sections of coal bed in Baxter mine

Section	A		B		C	
Laboratory No.	83166		83167		83168	
	Ft.	in.	Ft.	in.	Ft.	in.
Dirty coal*		3½		1		
Coal						3½
Sulphur*						½
Coal		10		11		5½
Bony coal*		½		½		½
Coal						9
Sulphur						¾
Coal	2	4	2	4	1	7
Thickness of bed	3	6	3	4½	3	2¼
Thickness of sample	3	2	3	3	3	1¼

*Not included in sample.

Coal is undercut by machine, and black blasting powder used. At the time of sampling the daily output was 75 tons, all from advance workings; 75 per cent was run-of-mine; ¾-inch screens were used. Coal is picked on car. The output in 1920 was 40,000 tons. In 1921 the life of mine was estimated to be 20 years.

KITTANNING. No. 2 BUFFINGTON MINE

Analyses 83163 to 83165 (p. 25). A drift mine 200 feet above station at Kittanning on the P. R. R. Upper Freeport coal. General dip to southeast. Roof, slate; floor, fireclay. Sampled at two points by L. D. Woodworth on November 30, 1921.

Sections of coal bed in No. 2 Buffington mine

Section	A		B	
Laboratory No.	83163		83164	
	Ft.	in.	Ft.	in.
Coal	1	0	1	4
Sulphur*		½		
Bony coal*				½
Coal	1	9		7
Bony coal*				½
Coal				10
Thickness of bed	2	9½	2	9¾
Thickness of sample	2	9	2	9

*Not included in sample.

Coal is undercut with machine, and shot down with black powder. The mine was idle in 1921, but when working the average daily output is 150 tons.

KITTANNING. TOY MINE

Analyses 83110 to 83113 (p. 25). A drift mine 200 feet above station at Manorville, 2 miles south of Kittanning, on the P. R. R. Upper Freeport coal. General dip to southwest. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on November 23, 1921.

Sections of coal bed in Toy mine

Section	A		B		C	
Laboratory No.	83110		83111		83112	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal			1	7		3
Dirty coal*		1				
Mother coal				¼		½*
Coal	1	8	1	4	1	5
Mother coal		¼				
Coal		6				
Mother coal*		1				½
Coal		2				7
Mother coal*		½				½
Coal		8				7
Slate*		5		5		5
Thickness of bed	3	7¾	3	4¼	3	4½
Thickness of sample	3	¼	2	11¼	2	10

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 100 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. The area of coal was 260 acres, and in 1922 the life of mine was estimated at 25 years.

LEECHBURG. ARMSTRONG MINE

Analyses 85767 to 85770 (p. 25). A drift mine 827.34 feet above sea level, 1 mile northeast of Leechburg on the P. R. R. Lower Freeport coal. Dip, southeast; strike northeast. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on May 13, 1922.

Sections of coal bed in Armstrong mine

Section	A		B		C	
Laboratory No.	85767		85768		85769	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	10	2	7	2	10
Bony coal*		½		½		
Coal and shale*						3
Coal		7		6		
Coal and shale*		2		3		
Thickness of bed	3	7½	3	4½	3	1
Thickness of sample	3	5	3	1	2	10

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 100 tons, all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 100 years.

LEECHBURG. No. 2 WEST LEECHBURG MINE

Analyses 85759 to 85762 (p. 25). A drift mine about 850 feet above sea level, 1 mile west of Leechburg on P. R. R. Upper Freeport coal. Low dip to southeast; strike, northeast. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on May 12, 1922.

Sections of coal bed in West Leechburg mine

Section	A		B		C	
Laboratory No.	85759		85760		85761	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		3		4		3
Coal	2	7½	2	6	2	9
Bony coal*		½		½		½
Coal		8		7		7
Thickness of bed	3	7	3	5½	3	7½
Thickness of sample	3	3½	3	1	3	4

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 125 tons, all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated at 20 years. Coal is crushed by rolls at tipple. It is not shipped, but is sent by bucket line to steel plant.

McWILLIAMS. HINES BANK

Analyses 83255 to 83257 (p. 26). A drift mine 1½ miles north of McWilliams, on the P. & S. R. R. Upper Freeport coal. General dip to southwest. Roof, slate; floor, fireclay. Measured at two points by L. D. Woodworth on December 5, 1921.

Sections of coal bed in Hines bank

Section	A		B	
Laboratory No.	83255		83256	
	Ft.	in.	Ft.	in.
Bony coal		8		8
Coal	4	2	4	1
Thickness of bed	4	10	4	9
Thickness of sample	4	2	4	1

Coal is undercut by hand, and is all run-of-mine. The property contains 15 acres of coal. This is a country bank for local use.

MOHAWK. No. 3 MOHAWK MINE

Analyses 83497 to 83501 (p. 26). A drift mine 975 feet above sea level, at Mohawk on the P. & S. R. R. Lower Kittanning coal. General dip to southwest. Roof, slate; floor, fireclay. Sampled at four points by L. D. Woodworth on December 19, 1921.

Sections of coal bed in No. 3 Mohawk mine

Section	A		B		C		D	
Laboratory No.	83497		83498		83499		83500	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		2						
Coal		9		10	1	1		
Bony coal*				½		½		4
Sulphur*		1						
Coal	2	6	1	2	1	10	2	10
Sulphur*				1				
Sulphur and coal*						7		
Coal				9				
Sulphur*				1				
Coal				4				
Sulphur*				½				
Coal*				2				
Thickness of bed	3	6	3	6	3	6½	3	2
Thickness of sample	3	3	3	1	2	11	2	10

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. Shaker screens are used—sizes, ⅝, ⅞ and 1½ inch. Coal is picked on table. At the time of sampling the daily output was 900 tons, 80 per cent from advance workings; 80 per cent of coal is run-of-mine. The area of coal was 1800 acres, and in 1921 the life of mine was estimated at 50 years.

NEW BETHLEHEM. No. 6 PINE RUN MINE

Analyses 82885 to 82887 (p. 26). A drift mine of Pine Run Coal Co. 50 feet below No. 10 mine, 2 miles south of New Bethlehem on the P. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Sampled at two points by L. D. Woodworth on November 14, 1921.

Sections of coal bed in No. 6 Pine Run mine

Section	A		B	
Laboratory No.	82885		82886	
	Ft.	in.	Ft.	in.
Coal*		2		1
Slate*		1		½
Coal	3	0	2	0
Bony coal*		2		
Sulphur*				2
Coal			1	10
Bony coal*				2
Thickness of bed	3	5	4	3½
Thickness of sample	3	0	3	10

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. The mine was opened in 1921, and it is intended to operate at 500 tons a day. It was partly flooded when sampled. All coal is run-of-mine, from advance workings. In 1921 the life of mine was estimated to be 15 years.

NEW BETHLEHEM. No. 10 PINE RUN MINE

Analyses 82881 to 82884 (p. 27). A drift mine of Pine Run Coal Co. 1303.2 feet above sea level, 2 miles south of New Bethlehem on the P. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on November 14, 1921.

Sections of coal bed in No. 10 Pine Run mine

Section	A		B		C	
Laboratory No.	82881		82882		82883	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal	1	1	1	1	1	2
Coal	3	7	3	6	3	5
Thickness of bed	4	8	4	7	4	7
Thickness of sample	3	7	3	6	3	5

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 400 tons, 90 per cent from advance workings. All coal is run-of-mine. In 1921 the life of mine was estimated to be 5 years.

OAK HILL. OAK HILL MINE

Analyses 83650 to 83653 (p. 27). A drift mine 100 feet above Oak Hill station, on the P. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Measured at 3 points by L. D. Woodworth on January 6, 1922.

Sections of coal bed in Oak Hill mine

Section	A		B		C	
Laboratory No.	83650		83651		83652	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	7½	2	7½	2	5
Slate*		½		½		½
Coal		8		7		8
Slate*		1		1		½
Coal		6		6		10
Thickness of bed	3	11	3	10	4	0
Thickness of sample	3	9½	3	8½	3	11

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 200 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. In 1922 the life of mine was estimated to be 15 years.

PUTNEYVILLE. SANDY HOLLOW MINE

Analyses 83321 to 83324 (p. 27). A drift mine 150 feet above station at Oakland Junction, 1 mile west of Putneyville, on the P. & S. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 8, 1921.

Sections of coal bed in Sandy Hollow mine

Section	A		B		C	
Laboratory No.	83321		83322		83323	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		10		6		8
Coal	3	11	3	11	1	8
Sulphur*						½
Coal					2	2
Thickness of bed	4	9	4	5	4	6½
Thickness of sample	3	11	3	11	3	10

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 285 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. The area of coal was 200 acres, and in 1921 the life of mine was estimated to be 15 years.

RIMERTON. PEACH HILL MINE

Analyses 83208 to 83211 (p. 27). A drift mine 300 feet above Rimerton station on the P. R. R. ½ mile west of Rimer P. O. Lower Kittanning coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 1, 1921.

Sections of coal bed in Peach Hill mine

Section	A		B		C	
Laboratory No.	83208		83209		83210	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		11		8		10
Bony coal		¼				
Sulphur				½	*	½
Coal	1	1	2	0	1	7
Sulphur*		½				½
Coal		10				7
Sulphur*		½				
Coal		5				
Thickness of bed	3	4¼	2	8½	3	1
Thickness of sample	3	3¼	2	8½	3	0

*Not included in sample.

Coal is undercut with machines, and shot down with black powder. At the time of sampling the daily output was 125 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. The mine was idle at the time of sampling, and in 1921 its life was estimated to be 50 years.

RIMERTON. RIMERTON MINE

Analyses 83212 to 83215 (p. 27). A drift mine 300 feet above station at Rimerton, 1 mile south of Rimer P. O., on the P. R. R. Lower Kittanning coal. Roof, slate; floor fireclay. Measured at three points by L. D. Woodworth on December 2, 1921.

Sections of coal bed in Rimerton mine

Section	A		B		C	
Laboratory No.	83212		83213		83214	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		1	1			
Sulphur*		1				
Bony coal*				½		2
Coal		4	1	3	2	5
Sulphur and coal*						6
Sulphur*		½		½		
Coal		3	1	2		
Sulphur*		½				
Coal		6½				
Bony coal*		½				1
Coal	2	4				5
Sulphur*		½				
Coal		6				
Thickness of bed	4	3½	3	6	3	7
Thickness of sample	4	½	3	5	2	10

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 175 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 35 years.

SAGAMORE. No. 17 BUFFALO & SUSQUEHANNA MINE

Analyses 81575 to 81578 (p. 27). A drift mine of Buffalo & Susquehanna Coal & Coke Co., 1080 feet above sea level, at Sagamore, on the B. & S. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at three points on September 16, 1921, by L. D. Woodworth.

Sections of coal bed in No. 17 Buffalo & Susquehanna mine

Section	A		B		C	
Laboratory No.	81575		81576		81577	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		3		6	1	5
Bony coal*		2	----	----		4½
Mother coal	----	----		½	----	----
Coal	1	9	1	1		4
Bony coal*		7		5	----	----
Mother coal	----	----	----	----		½
Coal		8		8½		11
Mother coal		1	----	----	----	----
Sulphur	----	----		¼	*	½
Coal	2	7	1	6	1	11
Slate*		1	----	----		1
Sulphur	----	----		¼	----	----
Coal		6	1	2		5
Slate*	----	----		½	----	----
Coal	----	----		5	----	----
Thickness of bed	6	8	5	11	5	6½
Thickness of sample	5	10	5	5½	5	½

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 1100 tons, 90 per cent from advance workings. All coal is run-of-mine, and is picked on car. In 1921 the life of mine was estimated to be 10 years.

SEMINOLE. No. 2 SEMINOLE MINE

Analyses 83349, 83350 to 83354 (p. 27). A drift mine 20 feet above station at Seminole, on the P. & S. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at two points by L. D. Woodworth on December 12, 1921.

Sections of coal bed in No. 2 Seminole mine

Section	A		B	
Laboratory No.	83349		83350	
	Ft.	in.	Ft.	in.
Coal	2	11	3	7
Sulphur		½	----	----
Coal		10	----	----
Thickness of bed	3	9½	3	7
Thickness of sample	3	9	3	7

Coal is undercut by machine, and shot down with black powder. Coal is picked on car.

At the time of sampling the daily output was 1500 tons, 75 per cent from advance workings; 85 per cent is run-of-mine. Coal is screened on ¾ inch screens. In 1921 the life of mine was estimated to be 15 years.

SEMINOLE. No. 14 SEMINOLE MINE

Analyses 83351 to 83355 (p. 28). A drift mine 20 feet above station at Seminole, on the P. & S. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 12, 1921.

Sections of coal bed in No. 14 Seminole mine

Section	A		B		C	
Laboratory No.	83351		83352		83353	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	11	2	7	2	8
Bony coal*		3		4		1
Coal		7		8		2
Bony coal*	----	----	----	----		1
Coal	----	----	----	----		7
Thickness of bed	3	9	3	7	3	7
Thickness of sample	3	6	3	3	3	5

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 1500 tons, 75 per cent from advance workings; 85 per cent was run-in-mine; ¾ inch screens are used. In 1921 the life of mine was estimated to be 15 years.

TEMPLETON. No. 2 TEMPLETON MINE

Analyses 83205 to 83207 (p. 28). A drift mine 200 feet above and ¼ mile south of Templeton. Does not ship coal. Upper Freeport coal. Thickness of bed, coal, and samples, 30 inches. Roof, slate; floor, fireclay. The bed was sampled at two points by L. D. Woodworth on December 3, 1921.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 50 tons, all from advance workings. All coal is run-of-mine. In 1921 the life of mine was estimated to be 50 years.

THAYERTON. MAHONING RIVER MINE

Analyses 83325 to 83328 (p. 28). A drift mine 1183 feet above sea level at Thayerton on the P. & S. R. R. Upper Freeport coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on December 9, 1921.

Sections of coal bed in Mahoning River mine

Section	A		B		C	
Laboratory No.	83325		83326		83327	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	10	2	6	2	1
Bony coal		6		10	1	0
Thickness of bed	3	4	3	4	3	1
Thickness of sample	2	10	2	6	2	1

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 250 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 50 years. The coal area was 1300 acres.

VANDERGRIFT. CLIMAX MINE

Analyses 85704 to 85706 (p. 28). A drift mine 850 feet above sea level, across the river from Vandergrift. No railroad connections and does not ship coal, but supplies local trade. Upper Freeport coal. Slight dip to northwest; strike, northeast. Roof, shale; floor, soft fireclay. Sampled at two points on May 9, 1922, by L. D. Woodworth.

Sections of coal bed in Climax mine

Section	A		B	
Laboratory No.	85704		85705	
	Ft.	in.	Ft.	in.
Coal	2	1	2	5
Bony coal*		1		1
Coal		5		4
Coal and shale*				2
Thickness of bed	2	7	3	0
Thickness of sample	2	6	2	9

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 25 tons all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 20 years.

VANDERGRIFT. KEPPLE MINE

Analyses 85700 to 85703 (p. 28). A drift mine 811.46 feet above sea level across the river west of Vandergrift, on the P. R. R. Upper Freeport coal. Low dip southeast; strike, northeast. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on May 9, 1922.

Sections of coal bed in Kepple mine

Section	A		B		C	
Laboratory No.	85700		85701		85702	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal and Sulphur*				1		1
Coal	2	2	2	8	2	2
Bony coal*		¼				¼
Coal		4				4
Bony coal*		5		4		4
Coal		4		3		4
Thickness of bed	3	3¼	3	4	3	3¼
Thickness of sample	2	10¼	2	11	2	10¼

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 40 tons all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 15 years.

BEAVER COUNTY

CANNELTON STATION. BEAVER CANNEL MINE

Analyses 34650 to 34652 (p. 29). Beaver Cannel Co's. mine, 1½ miles northwest of Cannelton station on the P. L. & W. R. R. Upper Kittanning coal. Roof and floor, slate. Depth at point of sampling, 200 feet. Sampled at two points by E. G. Hill on June 16, 1920.

Sections of coal bed in Beaver Cannel mine

Section	A		B	
Laboratory No.	34650		34651	
	Ft.	in.	Ft.	in.
Bone cannel*		3		
Cannel coal*		2		
Cannel coal		8		8
Bituminous block coal	2	0	2	2
Thickness of bed	3	1	2	10
Thickness of sample	2	8	2	10

*Not included in sample.

CANNELTON STATION. CANNELTON CLAY & COAL MINE

Analyses 34656 to 34658 (p. 29). Cannelton Clay & Coal Co. mine, 1 mile northwest of Cannelton on the P. L. & W. R. R. Mahoning coal. Thickness of bed, coal, and samples, 2 feet 7 inches to 2 feet 9 inches. Roof, 8 inches bone, then slate; floor, clay. Depth at point of sampling, 60 feet. The bed was sampled at two points by L. D. Tracy on June 15, 1920.

In 1920 the daily output was 30 tons.

CANNELTON. PITTSBURGH-CANNELTON MINE

Analysis 80462 (p. 29). Pittsburgh-Cannelton Coal Co's. prospect, a drift mine 1080 feet above sea level, ¾ mile west of Cannelton on the P. L. & W. R. R. Upper Freeport coal. Practically horizontal. Roof, good shale; floor, soft clay. Sampled at one point on July 7, 1921, by Chas. R. Fettke of the Carnegie Institute of Technology, Pittsburgh, Pa.

Section of coal bed in Pittsburgh-Cannelton mine

Section	A	
Laboratory No.	80462	
	Ft.	in.
Coal	1	1½
Black shale		½
Coal	1	1½
Black shale		½
Coal	1	3½
Shale*		1½
Coal*		3
Thickness of bed	4	0
Thickness of sample	3	7½

*Not included in sample.

BLAIR COUNTY

COUPON. HORSESHOE MINE

Analyses 81677 to 81679 (p. 31). A drift, wagon mine, 2380 feet above sea level, ½ mile east of Coupon. Lower Kittanning coal. Dip 10 per cent northwest. Roof and floor, slate. Sampled at two points on September 21, 1921, by L. D. Woodworth.

Sections of coal bed in Horseshoe mine

Section	A		B	
Laboratory No.	81677		81678	
	Ft.	in.	Ft.	in.
Bony coal*		7		7
Coal	1	4	1	2
Bony coal*		¼	*	½
Coal		4	1	0
Bony coal*		¼		
Coal		5		
Thickness of bed	2	8½	2	9½
Thickness of sample	2	1½	2	2

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 10 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. A daily output of 100 to 200 tons was expected.

COUPON. No. 2 RUSSET MINE

Analyses 81680 to 81683 (p. 31). A drift, wagon mine, 2400 feet above sea level, ½ mile east of Coupon. Brookville coal. Dip 6 per cent northwest. Roof and floor, slate. Depth at point of sampling, 60 to 70 feet. Sampled at three points on September 21, 1921, by L. D. Woodworth.

Sections of coal bed in No. 2 Russet mine

Section	A		B		C	
Laboratory No.	81680		81681		81682	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	0		8½	1	0
Bone*		½				½
Sulphur				⅛		
Coal				3		
Bony coal*				1		
Coal	2	11½	2	5⅜	2	6½
Slate*		1		1		1
Coal*		4		4		4
Slate*		1		1		1
Coal		6		6		6
Thickness of bed	5	0	4	6	4	7
Thickness of sample	3	11½	3	5	3	6½

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 375 tons, 80 per cent from advance workings. All coal is run-of-mine. Coal is picked on car and screened. The output in 1920 was 60,000 tons. In 1921 the life of mine was estimated to be 20 years.

BRADFORD COUNTY

LONG VALLEY STATION. LONG VALLEY MINE

Analyses 75523 to 75525 (p. 31). A mine, 2 miles northwest of Long Valley Station on the S. & N. Y. R. R. Clarion coal. Roof, sandstone; floor, shale. Depth at point of sampling, 30 feet. The bed was sampled at two points by E. G. Hill on August 7, 1920.

Sections of coal bed in Long Valley mine

Section	A		B	
Laboratory No.	75523		75524	
	Ft.	in.	Ft.	in.
Coal	1	6	1	10
Bone*	1	10		4
Coal	1	0		6
Bone*				5
Coal				7
Thickness of bed	4	4	3	8
Thickness of sample	2	6	2	11

*Not included in sample.

At the time of sampling the daily output was 20 tons.

BUTLER COUNTY

HARBISON STATION. McANULTY MINE

Analyses 85804 to 85806 (p. 33). A drift mine about 950 feet above sea level, 1 mile northwest of Harbison Station on the P. R. R. Upper Freeport coal. Dip, south; strike, east. Roof, shale; floor, fireclay. Sampled at two points by L. D. Woodworth on May 17, 1922.

Sections of coal bed in McAnulty mine

Section	A		B	
Laboratory No.	85804		85805	
	Ft.	in.	Ft.	in.
Coal and shale*		3		2
Coal		4	2	5
Mother coal*		½	---	---
Bony coal*	---	---		½
Coal	2	2		6
Shale*		½		1
Coal		4		3
Bony coal*		½	---	---
Coal		3	---	---
Thickness of bed	3	5½	3	5½
Thickness of sample	3	1	3	2

*Not included in sample.

Coal is undercut by machine, and shot down with black powder and permissible explosives. At the time of sampling the daily output was 40 tons, all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 25 years.

KEPPLE'S STATION. KEPPLE MINE

Analyses 85774 to 85776 (p. 33). A drift mine about 880 feet above sea level, at Kepple's station, on Winfield branch of the P. R. R. Upper Freeport coal. Dip, southeast (slight); strike, northeast. Roof, shale; floor, fireclay. Sampled at two points on May 15, 1922, by L. D. Woodworth.

Sections of coal bed in Kepple mine

Section	A		B	
Laboratory No.	85774		85775	
	Ft.	in.	Ft.	in.
Coal and shale*	---	---		2
Coal	---	---		3
Coal and shale		2*		¼
Coal	2	6½	2	6
Coal and shale*		5		¼
Thickness of bed	3	1½	2	11½
Thickness of sample	2	6½	2	9¼

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 10 tons, all from advance workings. All coal is run-of-mine. Life of mine was estimated to be 20 years.

SARVER. CUSTOM BANK

Analyses 85771 to 85773 (p. 34). A drift mine, about 1075 feet above sea level, 1½ miles southwest of Sarver, on the P. R. R. Upper Freeport coal. Dip south; strike, east. Roof, shale; floor, fireclay. Sampled at two points on May 16, 1922, by L. D. Woodworth.

Sections of coal bed in Custom bank

	A		B	
Section	A		B	
Laboratory No.	85771		85772	
	Ft.	in.	Ft.	in.
Bony streaked coal*	1	0	1	2
Coal	2	10	2	6
Shale*		½		½
Coal		4		3
Thickness of bed	4	2½	3	11½
Thickness of sample	3	2	2	9

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 10 tons, all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 25 years.

CAMBRIA COUNTY

CRESSON. No. 9-B CRESSON MINE

Analyses 84135, 84136, and 84249 (p. 41). A shaft mine 520 feet deep, 2066 feet above sea level at Cresson, on main line of P. R. R. Lower Kittanning coal; fairly level. Roof, slate; floor, fireclay. Sampled at two points on February 2, 1922, by L. D. Tracy (USBM).

Sections of coal bed in Cresson mine

Section	A		B	
Laboratory No.	84135		84136	
	Ft.	in.	Ft.	in.
Black slate*	15	0	15	0
Roof coal*		6		6
Slate*		6		6
Coal	1	2	1	1
Binder		½		1
Coal		10	1	3¼
Thickness of bed	18	½	18	5¼
Thickness of sample	2	½	2	5¼

*Not included in sample.

Coal is undercut by hand, and is run-of-mine.

CAMERON COUNTY

STERLING RUN. BERRY MINE

Analyses 75467 to 75469 (p. 59). A drift mine, 3 miles northeast of Sterling Run, Lumber Township, on the P. R. R. Upper Alton coal. Roof, slate; floor, clay. Cover at point of sampling, 40 feet. Thickness of bed, coal, and samples 75467 and 75468 is 42 inches. The bed was sampled at two points by E. G. Hill on July 26, 1920, both 200 feet inside.

At the time of sampling the daily output was 10 tons.

CENTRE COUNTY

CLARANCE. CHAMBERS-AZZLE No. 10 MINE

Analyses 81868 to 81871 (p. 59). A drift mine of Chambers-Azzle Coal Co., ½ mile northwest of Clarance, on the P. R. R. Lower Kittanning coal. Dip, 2 per cent north. Roof, sandstone; floor, fireclay. Sampled at three points on October 3, 1921, by L. D. Woodworth.

Sections of coal bed in No. 10 mine

Section	A		B		C	
Laboratory No.	81868		81869		81870	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		7	----	----		4
Coal	1	1		5	1	5
Bony coal		3*		¼		4*
Coal	1	1		4		10
Sulphur	----	----		¼	----	----
Bony coal*		2	----	----		3
Coal	----	----	2	2	----	----
Bony coal*	----	----		4	----	----
Thickness of bed	3	2	3	3½	3	2
Thickness of sample	2	2	2	11½	2	3

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 100 tons, all from advance workings. All coal is run-of-mine, and is picked on car.

MOSHANNON. No. 3 CHERRY RUN MINE

Analyses 81881 to 81884 (p. 60). A drift mine 1½ miles northeast of Moshannon, on the P. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Sampled at three points on October 4, 1921, by L. D. Woodworth.

Sections of coal bed in No. 3 Cherry Run mine

Section	A		B		C	
Laboratory No.	81881		81882		81883	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		1		4		3
Coal		10		4	3	3
Sulphur		½*		¼	----	----
Coal	3	4		11	----	----
Mother coal	----	----		¼	----	----
Coal	----	----	2	0	----	----
Thickness of bed	4	3½	3	7½	3	6
Thickness of sample	4	2	3	3½	3	3

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was from 300 to 400 tons. All coal is run-of-mine. The mine was idle, due partly to being flooded.

MOSHANNON. No. 20 MORGAN MINE

Analyses 81878 to 81880 (p. 60). A drift mine operated by O. G. Morgan of Snowshoe, ½ mile east of Moshannon, on the P. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Cover at point of sampling, 40 feet. Sampled at two points on October 4, 1921, by L. D. Woodworth.

Sections of coal bed in No. 20 Morgan mine

Section	A		B	
Laboratory No.	81878		81879	
	Ft.	in.	Ft.	in.
Bony coal*		9		9
Coal	1	2		5
Sulphur		¼		¼
Coal		2	2	0
Bony coal*		1		
Coal		10		
Thickness of bed	3	¼	3	2¼
Thickness om sample	2	2¼	2	5¼

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. All coal is run-of-mine from advance workings. Coal is picked on car. A day's maximum output is 25 tons. Mine was producing house coal for local use.

PHILIPSBURG. CHESTER MINE

Analyses 81817 to 81819 (p. 61). A drift mine 1470 feet above sea level, 1 mile east of Philipsburg on the N. Y. C. R. R. Lower Kittanning coal. Dip 5 per cent to northwest. Roof, slate; floor, fireclay. Cover at point of sampling, 90 feet. Sampled at two points on September 28, 1921, by L. D. Woodworth.

Sections of coal bed in Chester mine

Section	A		B	
Laboratory No.	81817		81818	
	Ft.	in.	Ft.	in.
Coal		6		2
Sulphur*		½		1
Coal		3		7
Bony coal*		7		7
Coal	2	6	1	8
Sulphur*		1		½
Coal		2		6
Thickness of bed	4	1½	3	7½
Thickness of sample	3	5	2	10

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 35 tons, all from advance workings. All coal is run-of-mine; and coal is picked on car. In 1921 the life of mine was estimated to be 20 years.

PHILIPSBURG. SMOOTH HILL No. 2 MINE

Analyses 81813 to 81816 (p. 61). A drift mine of Smooth Hill Coal Co., 1650 feet above sea level, 1 mile east of Philipsburg on the N. Y. C. R. R. Brookville coal. Dip, 6 to 7 per cent to southeast. Roof, slate; floor, sandstone. Sampled at three points on September 28, 1921, by L. D. Woodworth.

Sections of coal bed in No. 2 Smooth Hill mine

Section	A		B		C	
Laboratory No.	81813		81814		81815	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		7	2	1		6
Sulphur		2*		¼		1*
Coal	1	7	1	10	1	5
Sulphur		¼				¼
Slate*				2		
Coal	1	5		6	1	9
Slate*		2				3
Coal		6			*	4
Thickness of bed	4	5¼	4	7¼	4	4¼
Thickness of sample	4	1¼	4	5¼	3	8¼

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the maximum daily output was 200 tons, all from advance workings. All coal is run-of-mine, and is picked on car.

SANDY RIDGE. RETORT MINE

Analyses 81820 to 81823 (p. 61). A drift mine 1800 feet above sea level, at Sandy Ridge on the P. R. R. Lower Kittanning coal. Dip, 4 per cent N. W. Roof, slate; floor, fireclay. Sampled at three points on September 29, 1921, by L. D. Woodworth.

Sections of coal bed in Retort mine

Section	A		B		C	
Laboratory No.	81820		81821		81822	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		7		4		5
Bony coal*		6				6
Sulphur*				½		
Coal	3	9		3	2	8
Bony coal*				6		
Sulphur*						1
Coal			1	11		10
Sulphur				¼		
Coal			1	5		
Thickness of bed	4	10	4	5¾	4	6
Thickness of sample	4	4	3	11¼	3	11

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the maximum day's output was 250 tons, all from advance workings. All coal is run-of-mine.

CLARION COUNTY

CHURCH HILL. CHURCH HILL MINE

Analyses 34825 to 34827 (p. 62). A mine 1 mile east of Church Hill on the P. R. R. Lower Kittanning coal. Roof, 7 to 10 inches of draw-slate; floor, fireclay. Cover at point of sampling, 200 feet. Sampled at two points by E. G. Hill on July 7, 1920.

Sections of coal bed in Church Hill mine

Section	A		B	
Laboratory No.	34825		34826	
	Ft.	in.	Ft.	in.
Coal		10	1	0
Shale parting	*	1		½
Coal	2	2	2	5
Thickness of bed	3	1	3	5½
Thickness of sample	3	0	3	5

*Not included in sample.

At the time of sampling the daily output was 200 tons.

CLARION. REED BANK

Analyses 82976 to 82978 (p. 62). A drift mine ½ mile west of Clarion, on the L. E. and F. & C. R. railroads. Clarion coal. General dip to southwest. Roof and floor, shale. The bed was sampled at two points on November 19, 1921, by L. D. Woodworth.

Sections of coal bed in Reed bank

Section	A		B	
Laboratory No.	82976		82977	
	Ft.	in.	Ft.	in.
Bony coal*		5		3
Coal	1	4	2	2
Mother coal		¼		
Sulphur ball*				2
Coal	2	2	1	3
Bone*		1		
Bony coal*				7
Coal		1*	1	5
Bone*		4		
Coal*		1		
Thickness of bed	4	6¼	5	10
Thickness of sample	3	6¼	4	10

*Not included in sample.

Coal is undercut by hand, and shot down with black powder and permissible explosives. At the time of sampling the daily output was 10 tons, 50 per cent from advance workings. All coal is run-of-mine. Mine was partly flooded. In 1921 its life was estimated at 20 years.

CLARION. HARVEY NO. 1 MINE

Analyses 82972 to 82975 (p. 62). A drift mine 3 miles south of Clarion, on the L. E. and F. & C. railroads. Lower Kittanning coal. General dip, southwest. Roof, slate; floor, fireclay. Sampled at three points on November 18, 1921, by L. D. Woodworth.

Sections of coal bed in Harvey No. 1 mine

Section	A		B		C	
Laboratory No.	82972		82973		82974	
	Ft.	in.	Ft.	in.	Ft.	in.
Dirty coal*		3		2		2
Coal		5		5		7
Bony coal*		½		½		½
Coal	2	1	2	4½	1	8½
Sulphur*						½
Coal						5½
Thickness of bed	2	9½	3	0	3	0
Thickness of sample	2	6	2	9½	2	9

*Not included in sample.

Coal was undercut by hand, and shot down with black powder and permissible explosives. At the time of sampling the daily output was 150 tons, 50 per cent from advance workings. All coal is run-of-mine. Coal is picked on car. The output in 1920 was 30,000 tons. In 1921 the life of mine was estimated to be 8 years.

LAWSONHAM. LAWSONHAM MINE

Analyses 82877 to 82880 (p. 63). A drift mine 300 feet above and 1 mile east of station at Lawsonham on the P. R. R. Lower Kittanning coal. Local dips. Roof, slate; floor, fireclay. Sampled at three points on November 15, 1921, by L. D. Woodworth.

Section of coal bed in Lawsonham mine

Section	A		B		C	
Laboratory No.	82877		82878		82879	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		6		3		3
Coal		7	1	9		5
Bony coal*		½	---	---	---	---
Sulphur*	---	---		½		½
Coal	2	2	1	6	2	10
Sulphur*		½	---	---	---	---
Coal		2	---	---	---	---
Sulphur*		½	---	---	---	---
Coal		2	---	---	---	---
Thickness of bed	3	8½	3	6½	3	6½
Thickness of sample	3	1	3	3	3	3

*Not included in sample.

Coal was undercut by machine, and shot down with black powder. At the time of sampling the daily output was 100 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 50 years. The property contains 500 acres.

RED BANK. MORTIMER RUN MINE

Analyses 83019 to 83022 (p. 63). A drift mine 250 feet above and 1½ miles east of station at Red Bank on the P. R. R. Lower Kittanning coal. General dip southwest. Roof, slate; floor, fireclay. Sampled at three points on November 21, 1921, by L. D. Woodworth.

Sections of coal bed in Mortimer Run mine

Section	A		B		C	
Laboratory No.	83019		83020		83021	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		4		7		6
Coal		11		10		11
Bony coal		½*		¼		½*
Coal		10	2	1¾	1	11
Sulphur*		½	---	---	---	---
Coal		11	---	---	---	---
Sulphur*		½	---	---	---	---
Coal		1	---	---	---	---
Thickness of bed	3	2½	3	7	3	4½
Thickness of sample	2	9	3	0	2	10

*Not included in sample.

Coal was undercut by hand, and shot down with black powder. At the time of sampling the daily output was 50 tons, all from advance workings. All coal was run-of-mine, and was picked on car. The property consists of 50 acres. The mine was but recently opened when visited. In 1921 the life of mine was estimated to be 25 years.

ST. PETERSBURG. BOSTAPH MINE

Analyses 83056 to 83059 (p. 63). A drift mine 30 feet above station at St. Petersburg on the B. & O. R. R. Clarion coal. Local dips. Roof and floor, shale. The bed was sampled at three points on November 22, 1921, by L. D. Woodworth.

Sections of coal bed in Bostaph mine

Section	A		B		C	
Laboratory No.	83056		83057		83058	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	---	---		4	---	---
Sulphur*	---	---		3	---	---
Bony coal*		5	---	---		2
Coal	2	9	2	1	2	10
Slate*		6		4		5
Coal		10	1			10
Thickness of bed	4	6	4	0	4	3
Thickness of sample	3	7	3	5	3	8

*Not included in sample.

Coal was undercut by machine, and shot down with black powder. At the time of sampling the daily output was 100 tons, all from advance workings. All coal was run-of-mine, and coal was picked on car. The property consists of 561 acres. In 1921 the life of mine was estimated to be 50 years.

PARKER. CLARION RIVER MINE

Analyses 34822 to 34824 (p. 63). A mine ¾ mile north of Parker on the P. R. R. Upper Kittanning coal. Roof, shale 5 feet, above is sandstone; floor, sulphur and fireclay. Cover at point of sampling, 130 feet. Sampled at two points by E. G. Hill on July 1, 1920.

Sections of coal bed in Clarion River mine

Section	A		B	
Laboratory No.	34822		34823	
	Ft.	in.	Ft.	in.
Coal		11½		11
Sulphur		1½*		1
Coal	2	0	2	3
Sulphur		1*		1
Coal		7		8
Thickness of bed	3	9	4	0
Thickness of sample	3	6½	4	0

*Not included in sample.

At the time of sampling the daily output was 200 tons.

PHILLIPSTON. JAMES MINE

Analyses 34831 to 34833 (p. 63). Mine of W. J. James, ½ mile north of Phillipston, Brady Township, on the P. R. R. Lower Kittanning coal. Roof, sandstone; floor, fireclay. Cover at point of sampling, 125 feet. The bed was sampled at two points by E. G. Hill on July 12, 1920.

Sections of coal bed in James mine

	A		B	
Section	A		B	
Laboratory No.	34831		34832	
	Ft.	in.	Ft.	in.
Bone*		10		3
Coal	1	2	1	4½
Sulphur*		1		¾
Coal	2	0	2	1
Thickness of bed	4	1	3	9¼
Thickness of sample	3	2	3	5½

*Not included in sample.

At the time of sampling the daily output was 160 tons.

SARAH FURNACE. SARAH FURNACE MINE

Analyses 34834 to 34836 (p. 63). A drift mine ½ mile north of Sarah Furnace, on the P. R. R. Lower Kittanning coal. Roof, shale; floor, fireclay. Cover at point of sampling, 200 feet. Sampled at two points by E. G. Hill on July 10, 1920.

Sections of coal bed in Sarah Furnace mine

Section	A		B	
Laboratory No.	34834		34835	
	Ft.	in.	Ft.	in.
Coal	1	2	1	2
Bone		1		1
Coal	2	0	1	8
Thickness of bed	3	3	2	11
Thickness of sample	3	3	2	11

At the time of sampling the daily output was 400 tons.

UPPER HILLVILLE. BLUE GOOSE MINE

Analyses 34837 to 34839 (p. 64). A mine 1½ miles northeast of Upper Hillville, Perry Township, on the P. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Cover at point of sampling, 100 feet. Sampled at two points by E. G. Hill on July 9, 1920.

Sections of coal bed in Blue Goose mine

Section	A		B	
Laboratory No.	34837		34838	
	Ft.	in.	Ft.	in.
Coal		9		10
Bone*		1		1½
Coal	2	0	2	½
Thickness of bed	2	10	3	0
Thickness of sample	2	9	2	10½

*Not included in sample.

At the time of sampling the daily output was 60 tons.

WEST MONTEREY. MONTEREY MINE

Analyses 34828 to 34830 (p. 64). At mine 1⅛ miles east of Monterey, Perry Township, on the P. R. R. Clarion coal. Roof, slate; floor, fireclay. Cover at point of sampling, 100 feet. Sampled at two points by E. G. Hill on July 8, 1920.

Sections of coal bed in Monterey mine

Section	A		B	
Laboratory No.	34828		34829	
	Ft.	in.	Ft.	in.
Coal		9		9
Sulphur*		1		1
Coal	1	10¾		5
Sulphur	--	--		½
Coal	--	--	1	5
Thickness of bed	2	8¾	2	8½
Thickness of sample	2	7¾	2	7½

*Not included in sample.

At the time of sampling the daily output was 200 tons.

CLEARFIELD COUNTY

DUBOIS. NO. 1 SHAFT MINE

Analyses 82495 to 82500 (p. 67). Buffalo & Susquehanna Coal & Coke Co's. shaft mine, 266 feet deep, 1428 feet above sea level, 2 miles east of Dubois on the B. & S. R. R. Upper Freeport coal. Slight dip to north. Roof, fireclay. Sampled at five points on October 27, 1921, by L. D. Woodworth.

Sections of coal in No. 1 Shaft mine

Section	A		B		C		D		E	
Laboratory No.	82495		82496		82497		82498		82499	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony roof coal*		6	1	0	1	0	1	0	1	0
Coal		9	1	2	3	11	4	2	4	2
Bony coal		¼	--	--	--	--	--	--	--	--
Sulphur*	--	--		2		½	--	--	--	--
Coal	4	7	3	3		7	--	--	--	--
Slate*	--	--	--	--		½	--	--	--	--
Coal	--	--	--	--		3	--	--	--	--
Thickness of bed	5	10¼	5	7	5	10	5	2	5	2
Thickness of sample	5	4¼	4	5	4	9	4	2	4	2

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 800 tons, 75 per cent being from advance workings. All coal was run-of-mine, and was picked on car. Coal is screened. The output in 1920 was 200,000 tons. In 1921 the life of mine was estimated to be 10 years.

HELVETIA. STANLEY SHAFT MINE

Analyses 82501 to 82504 (p. 68). A shaft mine 150 feet deep, 1477 feet above sea level, 1½ miles west of Helvetia. Lower Freeport coal. Slight dip to west. Roof, fireclay; floor, 2 inches slate, 6 inches coal, then clay. Sampled at three points on October 29, 1921, by L. D. Woodworth.

Sections of coal bed in Stanley Shaft mine

	A		B		C	
Section	A		B		C	
Laboratory No.	82501		82502		82503	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	3	0	1	3		6
Mother coal		½		¼	—	—
Bony coal*	—	—	—	—		1
Coal	1	10	4	3	5	7
Slate*	—	—	—	—		2
Coal	—	—	—	—		6
Thickness of bed	4	10½	5	6¼	6	10
Thickness of sample	4	10½	5	6¼	6	7

*Not included in sample.

Coal is undercut by machine, and shot down with black powder and a permissible explosive. At the time of sampling the daily output was 30 tons, all from retreat operations. All coal was run-of-mine, and was picked on car. In 1921 the life of mine was estimated to be 7 years.

KARTHAUS. GONZALES NO. 1 MINE

Analyses 82001 to 82004 (p. 69). A drift mine of Gonzales Coal Mining Co., 500 feet above station 1 mile north of Karthaus on the N. Y. C. R. R. Lower Freeport coal. Slight dip to north. Roof, sandstone; floor, soft clay. Depth at point of sampling, 20 to 25 feet. Sampled at three points on October 10, 1921, by L. D. Woodworth.

Sections of coal bed in No. 1 Gonzales mine

	A		B		C	
Section	A		B		C	
Laboratory No.	82001		82002		82003	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	8	3	1	1	2½
Clay		1		2	—	—
Coal	1	0	—	—	—	—
Thickness of bed	3	9	3	3	1	2½
Thickness of sample	3	8	3	1	1	2½

At the time of sampling in 1921 the mine was just cutting main heading through, and had not started to ship coal.

LUTHERSBURG. LUTHERSBURG MINE

Analyses 82505 to 82508 (p. 69). A drift mine, 100 feet above and ½ mile east of station at Luthersburg, on the B. R. & P. R. R. Lower Kittanning coal. Slight dip to west. Roof, slate; floor, fireclay. Sampled at three points on October 28, 1921, by L. D. Woodworth.

Sections of coal bed in Luthersburg mine

	A		B		C	
Section	A		B		C	
Laboratory No.	82505		82506		82507	
	Ft.	in.	Ft.	in.	Ft.	in.
Dirty coal*		2		3		2
Coal	1	1		10		9
Sulphur*		½	—	—	—	—
Bony coal*	—	—		½		½
Coal	1	4	1	11	1	9
Thickness of bed	2	7½	3	½	2	8½
Thickness of sample	2	5	2	9	2	6

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 100 tons, all from advance workings. All coal is run-of-mine, and is picked on car. In 1921 the life of mine was estimated to be 8 years.

MUNSON. GHEM MINE

Analyses 81672 to 81676 (p. 71). A drift mine 1420 feet above sea level at Munson on the N. Y. C. R. R. Lower Kittanning coal. Slight dip to southeast. Roof, slate; floor, limestone. Sampled at four points on September 23, 1921, by L. D. Woodworth.

Sections of coal bed in Ghem mine

Section	A		B		C		D	
Laboratory No.	81672		81673		81674		81675	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	1	2	1	2	1	0	1	2
Coal	2	9	3	2	3	2	1	9
Slate*		½	-----	-----	-----	-----	-----	-----
Sulphur*	-----	-----	-----	-----	-----	-----		1
Coal		3	-----	-----	-----	-----	1	5
Thickness of bed	4	2½	4	4	4	2	4	5
Thickness of sample	3	0	3	2	3	2	3	2

*Not included in sample.

Coal was undercut by hand, and shot down with black powder and permissible explosives. At the time of sampling the daily output was 385 tons, 50 per cent from advance workings. All coal is run-of-mine, and is picked on car. In 1921 the life of mine was estimated to be 5 years.

WINBURNE. OGLE NO. 9 MINE

Analyses 81746 to 81752 (p. 74). A drift mine 1460 feet above sea level 1½ miles north of Winburne on the N. Y. C. R. R. Lower Kittanning coal. Dip 1 per cent to southeast. Roof, slate; floor, fireclay. Cover at point of sampling, 50 feet. Sampled at six points on September 26, 1921, by L. D. Woodworth.

Sections of coal bed in Ogle No. 9 mine

Section	A		B		C		D		E		F	
Laboratory No.	81746		81747		81748		81749		81750		81751	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	1	2	1	0	1	2	1	2	1	2	1	2
Coal	1	8		2		6	3	3	3	4	2	3
Sulphur		⅛		¼	*	½	-----	-----	-----	-----	*	½
Coal		2		3		3	-----	-----	-----	-----	1	0
Sulphur	*	½		¼	*	½	-----	-----	-----	-----	-----	-----
Coal		2	2	10½		6	-----	-----	-----	-----	-----	-----
Sulphur		¼	-----	-----	*	½	-----	-----	-----	-----	-----	-----
Coal		1	-----	-----		7	-----	-----	-----	-----	-----	-----
Sulphur		⅛	-----	-----		¼	-----	-----	-----	-----	-----	-----
Coal	1	0	-----	-----	1	3	-----	-----	-----	-----	-----	-----
Thickness of bed	4	4	4	4	4	4¾	4	5	4	6	4	5½
Thickness of sample	3	1½	3	4	3	1¼	3	3	3	4	3	3

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 1000 tons, 75 per cent from advance workings. All coal is run-of-mine, and coal is picked on table. In 1921 the life of mine was estimated to be 10 years.

CLEARFIELD. PROSPECT DRIFT MINE

Analysis 75625 (p. 66). A prospect drift 1½ miles west of Clearfield, on B. R. & P. R. R. Thickness of bed, coal, and sample, 22 inches. Roof, slate; floor, fireclay. Cover, 25 feet. Sampled at one point, 50 feet in, by E. G. Hill on August 11, 1920.

CLEARFIELD. MACTAVISH & BAILEY MINE

Analysis 75626 (p. 66). A mine, 1½ miles west of Clearfield, Lawrenee Township, on the B. R. & P. R. R. Middle Kittanning coal. Roof, slate; floor, clay. Cover at point of sampling, 40 feet. The bed was sampled at 1 point by E. G. Hill on August 11, 1920.

Section of coal bed in MacTavish & Bailey mine.

Laboratory No.	75626	
	Ft.	in.
Coal	1	1½
Slate binder		2
Coal	1	2
Thickness of bed	2	5½
Thickness of sample	2	3½

This section was measured 100 feet in. At the time of sampling the daily output was 12 tons.

CLEARFIELD. CASSIDY NO. 1 MINE

Analyses 75620 to 75622 (p. 67). A drift mine 3 miles west of Clearfield on the B. R. & P. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 60 to 65 feet. Sampled at two points by E. G. Hill on August 11, 1920.

Sections of coal bed in Cassidy No. 1 mine

Section	A		B	
Laboratory No.	75620		75621	
	Ft.	in.	Ft.	in.
Coal	2	6	2	4
Slate binder		3		3
Coal		10		10
Thickness of bed	3	7	3	5
Thickness of sample	3	4	3	2

At the time of sampling the daily output was 150 tons.

CLEARFIELD. EAGLE MINE

Analyses 75739 to 75741 (p. 66). A drift mine 2½ miles southwest of Clearfield on the P. R. R. Middle Kittanning coal. Roof, slate; floor, clay. Cover at point of sampling, 60 feet. Sampled at two points by E. G. Hill on August 17, 1920.

Sections of coal bed in Eagle mine

Section	A		B	
Laboratory No.	75739		75740	
	Ft.	in.	Ft.	in.
Bone*		11	1	2
Coal	3	0	2	10
Sulphur*				2
Coal				2
Thickness of bed	3	11	4	4
Thickness of sample	3	0	3	0

*Not included in sample.

At the time of sampling daily output was 120 tons.

CLEARFIELD. EAGLE MINE

Analysis 75742 (p. 66). A drift mine 2½ miles southwest of Clearfield, on the P. R. R. Lower Freeport coal. Cover at point of sampling, 45 feet. Sampled at one point by E. G. Hill on August 17, 1920.

Section of coal bed in Eagle mine

Laboratory No.	75742	
	Ft.	in.
Bone*		7
Coal	2	0
Binder*		2½
Coal		11
Thickness of bed	3	8½
Thickness of sample	2	11

*Not included in sample.

At the time of sampling the daily output was 120 tons.

CLEARFIELD. SCHICKLING MINE

Analysis 75672 (p. 67). A mine 3 miles west of Clearfield on the P. R. R. Upper Freeport coal. Thickness of bed, sample, and coal, 27 inches. Roof, slate; floor, fireclay. Cover at point of sampling (100 yards in main heading) 35 feet. Sampled by E. G. Hill on August 13, 1920. At the time of sampling the daily output was 10 tons.

CLEARFIELD. WILEY MINE

Analysis 75673 (p. 68). A mine 3 miles west of Clearfield on the P. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 45 feet. The bed was sampled at one point by E. G. Hill on August 13, 1920.

Section of coal bed in Wiley mine

Laboratory No.	75673	
	Ft.	in.
Bone*		3
Coal	1	10
Binder*		2
Coal		5
Thickness of bed	2	8
Thickness of sample	2	3

*Not included in sample.

CURWENSVILLE. ADDLEMAN MINE

Analysis 85623 (p. 67). A mine 1 mile south of Curwensville, Pike Township, on the P. R. R. Upper Freeport coal. Thickness of bed, coal, and sample, 25 inches. Roof, slate; floor, fireclay. Cover at point of sampling (250 yards in at face of main heading), 50 feet. Sampled at one point by E. G. Hill on August 15, 1920. At the time of sampling the daily output was 20 tons.

CURWENSVILLE. CALDWELL MINE

Analysis 75619 (p. 67). Moshannon or Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 60 feet. Sampled at one point by E. G. Hill on August 13, 1920.

Section of coal bed in Caldwell mine

Laboratory No.	75619	
	Ft.	in.
Coal	2	5
Slate binder		4
Coal		10
Thickness of bed	3	7
Thickness of sample	3	3

This section was measured at 5th right heading, 3,000 feet in. At the time of sampling the daily output was 300 tons.

CURWENSVILLE. NORRIS MINE

Analysis 75624 (p. 67). C. O. Norris mine, 1½ miles south of Curwensville, Pike Township, Lower Kittanning coal. Thickness of bed, 28 inches, and of coal and sample, 26 inches. Roof, slate; floor, fireclay. Cover at point of sampling (300 yards in at face of main heading), 40 feet. Sampled at one point by E. G. Hill on August 13, 1920, when the daily output was 25 tons.

IRVONA. GLENBROOK NO. 2 MINE

Analyses 75809 to 75811, (p. 68). A mine ½ mile north of Irvona, Beccaria Township, on the P. R. R. Lower Kittanning coal. Roof, sandstone; floor, fireclay. Cover at point of sampling 200 feet. Sampled at 2 points by E. G. Hill on August 28, 1920.

Sections of coal bed in Glenbrook No. 2 mine

Section	A		B	
Laboratory No.	75809		75810	
	Ft.	in.	Ft.	in.
Bone*		5		6
Coal	1	0		11
Sandstone*	1	2	1	1
Coal	3	0	3	0
Thickness of bed	5	7	5	6
Thickness of sample	4	0	3	11

*Not included in sample.

At the time of sampling the daily output was 120 tons.

McGEES MILLS. BUTTER BALL MINE

Analysis 75671 (p. 70). A mine ½ mile south of McGees Mills, Bell Township, on the P. R. R. Middle Kittanning coal. Roof, slate; floor, shale. Cover at point of sampling, 50 feet. Measured at one point by E. G. Hill on August 16, 1920.

Section of coal bed in Butter Ball mine

Laboratory No.	75671	
	Ft.	in.
Bone*	1	2
Coal	2	6
Binder*		¾
Coal		10
Thickness of bed	4	6¾
Thickness of sample	3	4

*Not included in sample.

At the time of sampling the daily output was 50 tons.

McGEES MILLS. SHERWOOD MINE

Analysis 75674 (p. 70). A mine at McGees Mills on the P. R. R. Upper Kittanning coal. Thickness of bed, coal, sample, 37 inches. Roof, slate; floor, fireclay. Cover at point of sampling (200 feet in at main heading), 40 feet. Sampled at one point by E. G. Hill on August 16, 1920, when the daily output was only a few tons.

MAHAFFEY. MAHAFFEY MINE

Analysis 75734 (p. 70). A mine ¼ mile south of Mahaffey on the P. R. R. Moshannon or Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 30 feet. Sampled at one point by E. G. Hill on August 16, 1920.

Section of coal bed in Mahaffey mine

Laboratory No.	75734	
	Ft.	in.
Coal	1	3
Slate binder		2
Coal	1	3
Thickness of bed	2	8
Thickness of sample	2	6

At the time of sampling the daily output was 25 tons.

PHILIPSBURG. CONQUEST MINE

Analyses 75731 to 75733 (p. 72). A mine 2½ miles northwest of Philipsburg, Morris Township, on the P. R. R. Roof, slate; floor, fireclay. Cover at point of sampling, 40 to 80 feet. Sampled at two points by E. G. Hill on August 19, 1920.

Sections of coal bed in Conquest mine

Section	A		B	
Laboratory No.	75731		75732	
	Ft.	in.	Ft.	in.
Bone*		9		6
Coal	1	1	3	8
Binder*		3		3
Coal	1	4		7
Thickness of bed	3	5	5	0
Thickness of sample	2	5	4	3

*Not included in sample.

At the time of sampling the daily output was 150 tons.

PHILIPSBURG. RODEN MINE.

Analysis 75735 (omitted). A mine 2½ miles northwest of Philipsburg on the P. R. R. Lower Kittanning coal. Roof, slate and shale; floor, fireclay. Cover at point of sampling, 60 feet. Sampled at one point, by E. G. Hill, on August 19, 1920.

Section of coal bed in Roden mine

Laboratory No.	75735	
	Ft.	in.
Coal	2	1
Clay and shale*		10½
Coal	1	1
Coal*		9
Thickness of bed	4	9½
Thickness of sample	3	2

*Not included in sample.

At the time of sampling the daily output was 100 tons.

SURVEYOR. GOSHEN NO. 2 MINE

Analyses 75548 to 75550 (p. 73). A mine ½ mile north of Surveyor on the N. Y. C. R. R. Lower Kittanning coal. Roof, sandstone; floor, fireclay. Cover at point of sampling, 40 to 150 feet. Sampled at two points by E. G. Hill on August 10, 1920.

Sections of coal bed in Goshen No. 2 mine

Section	A		B	
Laboratory No.	75548		75549	
	Ft.	in.	Ft.	in.
Coal	2	2	2	5
Binder	----	----		¾
Coal	----	----		10
Thickness of bed	2	2	3	3¾
Thickness of sample	2	2	3	3

At the time of sampling the daily output was 300 tons.

CLINTON COUNTY

BITUMEN. NO. 8 KETTLE CREEK MINE

Analyses 82005 to 82008 (p. 74). A drift mine 3 miles northwest of Bitumen, on the P. R. R. Lower Kittanning coal. Roof, sandstone; floor, fireclay. Sampled at three points on October 7, 1921, by L. D. Woodworth.

Sections of coal bed in No. 8 Kettle Creek mine

Section	A		B		C	
Laboratory No.	82005		82006		82007	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		5½	1	10	1	9
Bony coal*		1				
Sulphur*				½		1
Coal	2	3		9		5
Bony coal*		½		1		
Coal (bone and sulphur partings)*						9
Coal	1	1½	1	6½	1	2
Sulphur		¼				
Bone*						2
Coal		4				10
Thickness of bed	4	3¾	4	3	5	2
Thickness of sample	4	2¼	4	1½	4	2

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was from 150 to 200 tons, all from advance workings. All coal is run-of-mine, and is picked on car. At time of sampling the mine was idle and partly flooded.

LOCK HAVEN. SCOOTAC MINE

Analyses 75464 to 75466 (p. 75). A drift mine of Jacobs Creek Oil Co. P. R. R. Brookville coal. Roof, sandstone; floor, fireclay. Cover at point of sampling, 40 feet. Sampled at two points by E. G. Hill on August 4, 1920.

Sections of coal bed in Scootac mine

Section	A		B	
Laboratory No.	75464		75465	
	Ft.	in.	Ft.	in.
Coal		3		
Gray coal		4		
Bone*		4		2
Coal	2	9	4	4
Thickness of bed	3	8	4	6
Thickness of sample	3	4	4	4

*Not included in sample.

At the time of sampling the daily output was 150 tons.

ELK COUNTY

AVERYVILLE. STAR MINE

Analyses 34975 to 34977 (p. 75). A mine at Averyville, Benzinger Township, on the P. S. N. R. R. Three foot vein. Roof, shale; floor, fireclay. Cover at point of sampling, 20 to 70 feet. Sampled at two points by E. G. Hill on July 22, 1920.

Sections of coal in Star mine

Section	A		B	
Laboratory No.	34975		34976	
	Ft.	in.	Ft.	in.
Coal	1	1	1	2
Bone*		3		2
Coal	1	0		4
Bone*		6	----	----
Bone coal	----	----		1
Coal	----	----		8½
Bone*	----	----		2
Coal	----	----		9
Bone*	----	----		5
Thickness of bed	2	10	3	9½
Thickness of sample	2	1	3	½

*Not included in sample.

At the time of sampling the daily output was 120 tons.

BENEZETT. WINSLOW MINE

Analyses 75348 to 75350 (p. 75). A mine 2 miles north of Benezett on the B. & S. R. R. Lower Kittanning coal. Thickness of bed, coal, and samples at two points, 500 feet in mine, 2 feet 11½ inches and 3 feet 5 inches, respectively. Cover at point of sampling, 180 feet. Roof, shale; floor, fireclay. Sampled by E. G. Hill on July 24, 1920.

At the time of sampling the daily output was 20 tons.

BENZINGER. WEST BRANCH MINE

Analyses 34989 to 34991 (p. 75). A mine at Benzinger on the P. R. R. Middle Kittanning coal. Roof, slate; floor, bone. Cover at point of sampling, 65 to 120 feet. Sampled at two points by E. G. Hill on July 17, 1920.

Sections of coal bed in West Branch mine

Section	A		B	
Laboratory No.	34989		34990	
	Ft.	in.	Ft.	in.
Coal	1	3		9½
Coal (dull)		4		11*
Coal		3½	1	9
Bone*		8	----	----
Coal	1	9	----	----
Thickness of bed	4	3½	3	5½
Thickness of sample	3	1½	2	6½

*Not included in sample.

At the time of sampling the daily output was 100 tons.

FORCE. PROCTOR NO. 1 MINE

Analyses 75351 to 75354 (p. 75). A mine 2 miles west of Force, Jay Twp., on the P. S. & N. R. R. Lower Kittanning coal. Roof, shale; floor, fireclay. Cover at point of sampling, 180 to 200 feet. Sampled at three points by E. G. Hill on July 23, 1920.

Sections of coal bed in Proctor No. 1 mine

Section	A		B		C	
Laboratory No.	75351		75352		75353	
	Ft.	in.	Ft.	in.	Ft.	in.
Bone		4½		4		6
Coal	3	1	3	1½	2	11½
Thickness of bed	3	5½	3	5½	3	5½
Thickness of sample	3	1	3	1½	2	11½

At the time of sampling the daily output was 500 tons.

FAYETTE COUNTY

BELBOIS STATION. BELBOIS MINE

Analysis 84987 (p. 76). A drift wagon mine about 1,000 feet above sea level at Belbois Station on the P. R. R. Waynesburg coal (lower division). Dip, northwest; strike, northeast. Roof and floor, shale. Sampled at one point on March 29, 1922, by L. D. Woodworth.

Section of coal bed in Belbois mine

Laboratory No.	84987	
	Ft.	in.
Coal		11
Clay*		3
Coal		7
Bony coal*		1
Coal	2	8
Thickness of bed	4	6
Thickness of sample	4	2

*Not included in sample.

Coal was undercut by hand and was run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 15 years. The mine was idle at time of sampling.

BELBOIS STATION. CHERRY CAMP MINE

Analysis 84986 (p. 76). A drift mine, about 1,000 feet above sea level, at Belbois Station on the P. R. R. Waynesburg coal (upper division). Dip northwest; strike, northeast. Roof and floor of shale. The bed was sampled at one point on March 29, 1922, by L. D. Woodworth.

Section of coal bed in Cherry Camp mine

Laboratory No.	84986	
	Ft.	in.
Coal	1	5
Clay	2	10
Coal	1	7
Thickness of bed	5	10
Thickness of sample	3	0

Coal was undercut by hand. Coal is run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 10 years. This mine was but recently opened, and had a drift in only 30 feet.

CHEAT HAVEN. EAGLE MINE

Analyses 84588 to 84592 (p. 76). A drift mine 200 feet above and ½ mile west of Cheat Haven station, on the B. & O. R. R. Pittsburgh coal. Dip, southeast; strike, northeast. Roof, shale; floor, fireclay. The bed was sampled at 4 points by L. D. Woodworth on March 6, 1922.

Sections of coal bed in Eagle mine

Section	A		B		C		D	
Laboratory No.	84588		84589		84590		84591	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Roof coal (bony)	*1	0	1	0	*1	0	*1	0
Coal	1	1	-----	-----		7		10
Bony coal*		½		6		2		1
Coal	2	0	1	1		3	1	1
Bony coal*		½		1		½		1
Coal	2	5	2	5	1	1		4
Bony coal*	-----	-----		1		½		1
Coal	-----	-----	2	5		3	1	7
Bony coal*	-----	-----	-----	-----		½		1
Coal	-----	-----	-----	-----	2	1	2	2
Bony coal*	-----	-----	-----	-----		1	-----	-----
Coal	-----	-----	-----	-----	2	6	-----	-----
Thickness of bed	6	7	7	7	8	1½	7	4
Thickness of sample	5	6	6	11	6	9	6	0

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 750 tons, 80 per cent from advance workings; 75 per cent of the coal is run-of-mine. Coal is screened with ¾ bar screens, and is picked on belt. In 1922 the life of mine was estimated to be 20 years.

DUNBAR. AINSLEY MINE

Analyses 81339 to 81341 (p. 76). A dift mine 1100 feet above sea level, ½ mile east of Dunbar. Lower Freeport coal. Roof, shale; floor, shale and limestone. Cover at point of sampling, 90 feet. The bed was sampled at two points by E. G. Hill on August 27, 1921.

Sections of coal bed in Ainsley mine

Section	A		B	
Laboratory No.	81339		81340	
	Ft.	in.	Ft.	in.
Coal		4		4
Bone		2		2
Coal	2	3	2	2
Thickness of bed	2	9	2	8
Thickness of sample	2	7	2	6

Coal was undercut by hand. All coal is run-of-mine.

DUNBAR. FURNACE NO. 2 MINE

Analyses 81471 to 81474 (p. 77). A drift mine 1100 feet above sea level, ½ mile south of Dunbar. Upper Freeport coal. Roof, sandstone: and floor, shale. Cover at point of sampling, 75 to 100 feet or more. Sampled at three points by E. G. Hill on August 26, 1921.

Sections of coal bed in Furnace No. 2 mine

Section	A		B		C	
Laboratory No.	81471		81472		81473	
	Ft.	in.	Ft.	in.	Ft.	in.
Roof coal*		6		8		6
Check slate*		4		2		3
Draw slate*		6		7		8
Bony coal		2		4		7
Coal	2	7	2	7	2	7
Binder*		2		½		3
Coal	1	4	1	5	1	3
Shale*		1		1		1½
Bottom coal*		5		5		6
Thickness of bed	6	1	6	3½	6	8½
Thickness of sample	4	1	4	4	4	5

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 250 tons. Jig washers are used for all coal of ½ inch size; 100 per cent of ½ inch coal is coked. All coal is run-of-mine.

DUNBAR. COFFMAN MINE

Analyses 81494 and 81495 (p. 77). A clay and coal mine opened by drift 1100 feet above sea level, 1 mile east of Dunbar, on the P. R. R. Lower Kittanning coal. Roof, slate; floor, fireclay. Cover at point of sampling, 50 feet. The bed was sampled at two points by E. G. Hill on September 6, 1921. These analyses represent the full thickness of the bed—2 feet 4 inches and 2 feet 3 inches, respectively. Coal was undercut by hand. At the time of sampling the daily output was but a few tons. All coal is run-of-mine.

DUNBAR. HAIRE MINE

Analyses 81336 to 81338 (p. 77). A drift mine 1 mile west of Dunbar, on the P. R. R. Waynesburg coal. Dip, west. Roof, shale; floor, smooth shale. Cover at point of sampling, 75 feet. Sampled at two points by E. G. Hill on February 27, 1921

Sections of coal bed in Haire mine

Section	A		B	
Laboratory No.	81336		81337	
	Ft.	in.	Ft.	in.
Coal	2	3	2	0
Bone binder		3		3
Coal	1	1	1	1
Thickness of bed	3	7	3	4
Thickness of sample	3	4	3	1

Coal was undercut by hand.

FAIRCHANCE. DEYARMON MINE

Analyses 81564 to 81567 (p. 77). A drift mine at Fairchance on the P. R. R. Sewickley coal. Dip, 5 degrees southwest. Roof, sandstone or shale; floor fireclay. Cover at point of sampling, 100 to 150 feet. Sampled at three points by E. G. Hill on September 15, 1921.

Sections of coal bed in Deyarmon mine

Section	A		B		C	
Laboratory No.	81564		81565		81566	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal and bone*		5		3½	----	----
Coal	2	11		9		6½
Binder		¼		½		½
Coal		8	1	7	1	9
Binder		½	*	¾		½
Coal		10	2	2	1	9
Floor coal		4	----	----	----	----
Thickness of bed	5	2¾	4	10¾	4	1½
Thickness of sample	4	9¾	4	6½	4	1½

*Not included in sample.

Coal is undercut by machine, and shot down with permissible explosives. At the time of sampling the daily output was 200 tons, 75 per cent from advance workings. All coal is run-of-mine, and coal is picked on car.

FAIRCHANCE. SWANEY MINE

Analyses 84772 to 84774 (p. 77). A drift mine about 1165 feet above sea level, 1 mile west of Fairchance on the B. & O. R. R. Sewickley coal. Dip, to northwest; strike, northeast. Roof, shale; floor, hard shale. Sampled at two points by L. D. Woodworth on March 21, 1922.

Sections of coal bed in Swaney mine

Section	A		B	
Laboratory No.	84772		84773	
	Ft.	in.	Ft.	in.
Bony coal*		4		4
Coal	1	10	1	10
Shale		⅛	*	½
Coal		2		4
Shale		⅛	*	½
Coal		2	2	5½
Shale*		½	----	----
Coal and shale*	----	----		3
Coal	2	2	*	3
Shale*		1	----	----
Coal*		½	----	----
Shale*		1	----	----
Coal*		1	----	----
Thickness of bed	5	¼	5	6½
Thickness of sample	4	4¼	4	7½

*Not included in sample.

Coal is undercut by hand. Explosives are not used. At the time of sampling the daily output was 10 tons, all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 10 years. Coal carried 1 mile by motor truck to shipping point.

FAIRCHANCE. MARTIN MINE

Analyses 84840 to 84842 (p. 77). A drift mine 1060 feet above sea level, 1½ miles southwest of Fairchance. Pittsburgh coal. Dip, northwest; strike, northeast. Roof, shale; floor, fireclay. Sampled at two points by L. D. Woodworth on March 22, 1922.

Sections of coal bed in Martin mine

Section	A		B	
Laboratory No.	84840		84841	
	Ft.	in.	Ft.	in.
Coal	2	3	2	0
Bony coal*		½		½
Coal	2	½	1	10
Shale		¼		¼
Coal		4		4
Shale		¼		¼
Coal	1	6	1	4
Bony coal		¼	---	---
Shale	---	---		¼
Coal	1	2	1	8
Thickness of bed	7	4¾	7	3¼
Thickness of sample	7	4¼	7	2¾

*Not included in sample.

Coal is undercut by hand. At the time of sampling the daily output was 10 tons, all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 5 years.

FERGUSON. UNITED REFRACTORIES MINE

Analysis 81496 (p. 78). A drift mine ¾ mile from Ferguson. Lower Kittanning coal. Roof, slate; floor, fireclay. Cover at point of sampling, 150 feet. Sampled at one point by E. G. Hill on September 7, 1921.

Section of coal bed in United Refractories mine

Laboratory No.	81496	
	Ft.	in.
Coal	2	2
Coal (?) much sulphur	1	2
Thickness of bed	3	4
Thickness of sample	3	4

Coal is undercut by machine. The mine was closed at date of sampling.

GATES. GATES NO. 1 MINE

Analyses 84194 to 84197 (p. 78). A shaft mine of H. C. Frick Coke Co., 259 feet deep, at Gates on the Monongahela Railway. Pittsburgh coal. Level. Roof, top coal or slate; floor, hard, smooth fireclay. Sampled at three points by W. J. Fene on February 10, 1922.

Sections of coal bed in Gates No. 1 mine

Section	A		B		C	
Laboratory No.	84194		84195		84196	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	4	2½	5	0	3	5
Slate		1*		½*		¼
Coal	2	3	2	7		2
Slate*	---	---	---	---		¾
Coal	---	---	---	---		½
Slate*	---	---	---	---		¾
Coal	---	---	---	---		2
Slate	---	---	---	---		¾
Coal	---	---	---	---	3	0
Thickness of bed	6	6½	7	7½	6	10½
Thickness of sample	6	5½	7	7	6	10

*Not included in sample.

The mine is operated on the panel-and-butt-entries system. Coal is undercut by machine; Monobel No. 1, a permissible explosive, is used. At the time of sampling the daily output was 2800 tons, 50 per cent derived from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 30 years.

GATES. HARTLEY MINE.

Analyses 84256 to 84259 (p. 78). A drift mine 75 feet above and ½ mile east of Gates on the Monongahela Railway. Waynesburg coal. Roof and floor of shale. Sampled at 3 points by L. D. Woodworth on February 15, 1922.

Sections of coal bed in Hartley mine

Section	A		B		C	
Laboratory No.	84256		84257		84258	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		4		4		5
Bony coal*		1		½	----	----
Slate*	----	----	----	----		½
Coal		2		3		3
Bony coal*		1		½	----	----
Slate*	----	----	----	----		½
Coal		3		3		3
Clay*		2		2		2
Coal		3		4	----	----
Bony coal or slate*		½		½		½
Coal	1	3	1	7	2	0
Clay*	2	2		9		10
Coal	----	----	2	7	2	2
Coal and clay*		3	----	----	----	----
Coal	1	0	----	----	----	----
Thickness of bed	6	½	6	4½	6	2½
Thickness of sample	3	3	5	4	5	1

*Not included in sample.

Coal was undercut by hand; black powder was used. At the time of sampling the daily output was 75 tons, all from advance workings. All coal is run-of-mine, and is picked on car.

HOPWOOD. MEADOWBROOK MINE

Analyses 84885 to 84888 (p. 78). A slope mine about 1075 feet above sea level, 1 mile west of Hopwood, on the P. R. R. Sewickley coal. Dip, northwest; strike, N. 10° E. Roof, sandstone; floor, shale. Sampled at 3 points by L. D. Woodworth on March 25, 1922.

Sections of coal bed in Meadowbrook mine

Section	A		B		C	
Laboratory No.	84885		84886		84887	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		6		5		1
Coal		6		9		3
Shale		⅛		⅛		⅛
Coal		5		8		7
Shale		⅛	----	----		⅛
Coal and shale	----	----	*	4	----	----
Coal		7	2	4		4
Coal and shale*		4	----	----	----	----
Shale	----	----	----	----		⅛
Coal	2	4	----	----	1	0
Coal and shale*	----	----	----	----		5
Coal	----	----	----	----	2	2
Thickness of bed	4	8¼	4	6⅛	4	10⅜
Thickness of sample	3	10¼	3	9⅛	4	4⅜

*Not included in sample.

Coal is undercut by hand and machine, and shot down with permissible explosives. At the time of sampling the daily output was 350 tons, all from advance workings. All coal is run-of-mine, and is picked on car. In 1922 the life of mine was estimated to be 20 years.

INDIANHEAD. KUHN No. 2 MINE

Analyses 81467 to 81470 (p. 79). A drift mine 1380 feet above sea level, ½ mile west of Indian Head, on the Indian Creek Valley R. R. Lower Kittanning coal; level. Roof, slate; floor, hard fireclay. Sampled at three points on September 6, 1921, by L. D. Woodworth.

Sections of coal bed in No. 2 Indian Creek mine

Section	A		B		C	
Laboratory No.	81467		81468		81469	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		5		6		6
Coal		5		11		4
Sulphur		¼	*	2		
Bony coal *						½
Bone*		½				
Coal		4	1	11	2	8½
Bone*		½				
Coal	2	2¾				
Thickness of bed	3	6	3	6	3	7
Thickness of sample	3	0	2	10	3	½

*Not included in sample.

At the time of sampling the daily output was 300 tons, all run-of-mine.

LAYTON. JACOBS CREEK MINE

Analyses 85325 to 85327 (p. 79). A drift mine of Jacobs Creek Oil Co. 1 mile north of Layton and used only for local custom. Upper Freeport coal. Dip, southeast; strike, northeast. Roof, shale; floor, shale. Sampled at two points by L. D. Woodworth on April 3, 1922.

Sections of coal bed in Jacobs Creek mine

Section	A		B	
Laboratory No.	85325		85326	
	Ft.	in.	Ft.	in.
Coal		8		6
Sulphur		¼		
Coal, shale and sulphur*				2
Coal	2	9	2	8
Shale*		3		2
Coal	1	0	1	0
Thickness of bed	4	8¼	4	6
Thickness of sample	4	5¼	4	2

*Not included in sample.

Coal was undercut by hand, and shot down with black powder. All coal is run-of-mine, from advance workings. In 1922 the life of the mine was estimated to be 100 years.

LEISENRING. LEISENRING NO. 1 MINE

Analysis 80623 (p. 79). A shaft mine of H. C. Frick Coke Co. 385 feet deep, and 1,000 feet above sea level, at Leisenring, on the B. & O. R. R. Pittsburgh coal. Approximately horizontal. Roof, shale; floor, shale (hard). Cover at point of sampling, 400 feet. The bed was sampled on July 26, 1921, by Chas R. Fettke.

Section of coal in Leisenring No. 1 mine

Laboratory No.	80623	
	Ft.	in.
Coal (left to protect roof)*		10
Coal	2	10
Bone		¼
Coal	2	2½
Bone		¼
Coal	3	2
Thickness of bed	9	1
Thickness of sample	8	3

*Not included in sample.

Coal is undercut by machine. At the time of sampling the daily output was 1500 tons. All coal is coked in 500 beehive ovens. In 1921 the life of mine was estimated to be 45 years.

LEMONT FURNACE. GADDIS MINE

Analyses 81497 to 81500 (p. 79). A slope mine on the P. R. R.; shipping point, Youngstown. Sewickley coal; dip, 11 degrees, strike, north. Roof, slate; floor, smooth slate. Cover at point of sampling, 75 feet. Sampled at three points by E. G. Hill on September 7, 1921.

Sections of coal bed in Gaddis mine

Section	A		B		C	
Laboratory No.	81497		81498		81499	
	Ft.	in.	Ft.	in.	Ft.	in.
Bone or draw slate*		1		1		1
Roof coal	*	2½	1	10	2	4
Coal	2					
Bone		¼		½		¼
Coal	1	10	1	6	1	7
Slate parting*		½		2½		
Bone						½
Coal	1	4	1	4		11
Bone*		3		5		4
Thickness of bed	5	9¼	5	5	5	8¾
Thickness of sample	5	2¼	4	8½	4	10¼

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling daily output was 50 tons. All coal is run-of-mine. In 1921 the life of mine was estimated to be 10 years.

MASONTOWN. COUNTRY BANK.

Analysis 84154 (p. 79). A drift wagon mine, ½ mile south of Masontown. Redstone coal. Thickness of bed, coal, and sample, 39 inches. Roof, shale; floor, clay. Sampled on February 8, 1922, by L. D. Woodworth.

All coal is from advance workings and is run-of-mine. The property consists of 3 acres. Coal is undercut by hand, and shot down with black powder.

MASONTOWN. ROSS MINE

Analyses 84150 to 84153 (p. 79). A drift mine 100 feet above railroad ¾ mile south of Masontown, on the P. R. R. Sewickley coal. Roof, shale; floor, slate. Sampled at three points by L. D. Woodworth on February 8, 1922.

Sections of coal bed in Ross mine

Section	A		B		C	
Laboratory No.	84150		84151		84152	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		2	—	—		2
Coal		4		4		2
Slate*		½		1		½
Coal		3	1	11		6
Bony coal*	—	—	1	9		½
Slate		¼	—	—	—	—
Coal	2	3	2	0		9
Bony coal*		9	—	—		½
Coal	1	1	—	—	1	6
Coal and slate*		4	—	—	—	—
Bony coal*	—	—	—	—		6
Coal		6	—	—	2	
Slate*	—	—	—	—		1
Thickness of bed	5	8¾	6	1	5	9½
Thickness of sample	4	5¼	4	3	4	11

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 200 tons, all being run-of-mine from advance workings. Coal is picked on car. In 1922 the life of mine was estimated to be 30 years.

MASONTOWN. GRIFFIN NO. 1 MINE

Analyses 81558 to 81560 (p. 79). A drift mine 1 mile from Masontown, on the P. R. R. Pittsburgh coal. Roof and floor, slate or shale. Cover at point of sampling, 100 feet. Sampled at two points by E. G. Hill on September 13, 1921.

Sections of coal bed in Griffin No. 1 mine

Section	A		B	
Laboratory No.	81558		81559	
	Ft.	in.	Ft.	in.
Roof coal*	—	—		8
Coal	3	9	3	9
Parting		½		¾
Coal	—	—		3
Parting	—	—		¾
Coal	3	4	3	0
Bottom coal		5		6*
Thickness of bed	7	6½	8	3½
Thickness of sample	7	6½	7	1½

*Not included in sample.

Coal is undercut by machine, and shot down with permissible explosives. At the time of sampling the daily output was 200 tons, all from advance workings. All coal is run-of-mine. In 1921 the life of mine was estimated to be 20 years. At time of sampling the mine had just been opened.

MASONTOWN. PATRICK NO. 1 MINE

Analyses 84415 to 84418 (p. 79). A drift mine 1149 feet above sea level, 1 mile southeast of Masontown on the M. R. R. Sewickley coal. General dip to west. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on February 17, 1922.

Sections of coal bed in Patrick No. 1 mine.

Section	A		B		C	
Laboratory No.	84415		84416		84417	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	10	5	4½	4	11
Slate*		½				
Coal*		1				
Slate*		½				
Coal*		1				
Slate*		½				
Coal	2	0				
Floor coal (high sulphur)*		3				3
Thickness of bed	5	4½	5	4½	5	2
Thickness of sample	4	10	5	4½	4	11

*Not included in sample.

Coal was undercut by hand, and shot down with permissible explosives. At the time of sampling the daily output was 300 tons, 90 per cent from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 25 years.

MASONTOWN. PATRICK NO. 2 MINE

Analyses 81555 to 81557 (p. 79). A drift mine 1 mile east of Masontown, on the P. R. R. Sewickley coal. Roof and floor, sandstone. Cover at point of sampling, 100 feet. Sampled at two points by E. G. Hill on September 13, 1921.

Sections of coal bed in Patrick No. 2 mine

Section	A		B	
Laboratory No.	81555		81556	
	Ft.	in.	Ft.	in.
Sulphur and coal		1		
Coal	5	1	5	6
Thickness of bed	5	2	5	6
Thickness of sample	5	1	5	6

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 150 tons, all from advance workings. All coal is run-of-mine. In 1921 the life of mine was estimated to be 10 years.

MILL RUN. PENNY MINE

Analyses 81345 to 81347 (p. 80). A drift mine ½ mile west of Mill Run. Lower Kittanning coal. Roof, sandstone; floor, shale and clay. Cover at point of sampling, 75 to 100 feet. Sampled at two points by E. G. Hill on August 30, 1921.

Sections of coal bed in Penny mine

Section	A		B	
Laboratory No.	81345		81346	
	Ft.	in.	Ft.	in.
Coal	1	5	1	6
Bone binder*		2		4
Coal		11		7
Thickness of bed	2	6	2	5
Thickness of sample	2	4	2	1

*Not included in sample.

Coal is undercut by hand. At the time of sampling the daily output was 50 tons, all run-of-mine.

MT. BRADDOCK. AINSLEY MINE

Analyses 81614 to 81616 (p. 80). A slope entry of Mt. Braddock Coal Co. at Mt. Braddock, on the P. R. R. Pittsburgh coal. Roof and floor, hard shale. Cover at point of sampling, 40 feet. Sampled at two points by E. G. Hill on September 8, 1921.

Sections of coal bed in Ainsley mine

Section	A		B	
Laboratory No.	81614		81615	
	Ft.	in.	Ft.	in.
Coal	4	5	4	4
Parting		½		¼
Coal		3		5
Binder		¾		¾
Coal	2	7	3	3
Thickness of bed	7	4¼	8	1
Thickness of sample	7	4¼	8	1

Mining system, removing pillars. All work is done by hand, and coal is run-of-mine. At the time of sampling the daily output was but a few tons.

NEW GENEVA. STEVENSON MINE

Analyses 84318 to 84321 (p. 80). A drift mine 150 feet above station at Martin, ½ mile north of New Geneva, on the M. R. R. Sewickley coal. General dip to northwest. Roof and floor, shale. Sampled at three points by L. D. Woodworth on February 16, 1922.

Sections of coal bed in Stevenson mine

Section	A		B		C	
Laboratory No.	84318		84319		84320	
	Ft.	in.	Ft.	in.	Ft.	
Coal		6	2	9		2
Bony coal		¼	*	1	----	----
Slate*	----	----	----	----		½
Coal	2	0	2	4	2	5
Bony coal*		1	----	----		½
Coal	2	3	----	----		3
Bony coal*	----	----	----	----		½
Coal	----	----	----	----	2	4
Thickness of bed	4	10¼	5	2	5	3½
Thickness of sample	4	9¼	5	1	5	2

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 200 tons, all from advance workings; ¾ inch screens are used. Coal is picked on car. In 1922 the life of mine was estimated to be 10 years.

NEW GENEVA. HOFFMAN MINE

Analyses 84625 to 84628 (p. 80). A drift mine 2 miles southeast of New Geneva, on the M. R. R. Sewickley bed; dip, northwest; strike, northeast. Roof, shale; floor, hard clay. Sampled at three points by L. D. Woodworth on March 8, 1922.

Sections of coal bed in Hoffman mine

Section	A		B		C	
Laboratory No.	84625		84626		84627	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	---	---		4		2
Coal	1	9	1	5	1	8
Bony coal*		½		½		½
Coal		3		3½		2
Bony coal*		½		1		½
Coal	2	5	2	1	2	2½
Thickness of bed	4	6	4	3	4	3½
Thickness of sample	4	5	3	9½	4	½

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 100 tons, all from advance workings. All coal is run-of-mine and is picked on car. In 1922 the life of the mine was estimated to be 10 years. This mine was recently opened, and has 40 acres.

NEW GENEVA. ATLANTIC NO. 1 MINE

Analyses 84653 to 84657 (p. 81). A drift mine 1100 feet above sea level, 2½ miles southeast of New Geneva, on the M. R. R. Pittsburgh coal. Dip, northwest; strike northeast. Roof, shale; floor, hard clay. Sampled at four points by L. D. Woodworth on March 10, 1922.

Sections of coal bed in Atlantic No. 1 mine

Section	A		B		C		D	
Laboratory No.	84653		84654		84655		84656	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	1	6	1	7	1	8		4
Coal	1	3	1	1½	1	2	1	0
Bony coal	*	1		¼	*	½	*	7
Coal		4		4		4	1	7
Shale*		½	---	---	---	---	---	---
Bony coal*	---	---		1		1		½
Coal	1	6	1	2	1	4		4
Bony coal*		1		1		1		½
Coal	2	3	2	1	2	1	1	9
Bony coal*	---	---	---	---	---	---		½
Coal	---	---	---	---	---	---	2	3
Thickness of bed	7	½	6	5¾	6	9½	7	11½
Thickness of sample	5	4	4	8¾	4	11	6	11

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 500 tons, all from advance workings. All coal is run-of-mine, and coal is picked on car. The property consists of 108 acres. In 1922 the life of mine was estimated to be 15 years.

OHIOPYLE. BAILEY MINE

Analyses 81487 to 81489 (p. 81). A drift mine at Ohiopyle. Upper Kittanning coal. Roof, shale; floor, smooth shale. Cover at point of sampling, 150 feet. Sampled at two points by E. G. Hill on September 2, 1921.

Sections of coal bed in Bailey mine

Section	A		B	
Laboratory No.	81487		81488	
	Ft.	in.	Ft.	in.
Coal	2	8	1	3
Parting	------	------		1
Coal	------	------	1	2
Thickness of bed	2	8	2	6
Thickness of sample	2	8	2	5

Coal is shot off the solid, and at the time of sampling the daily output was 50 tons, run-of-mine.

OHIOPYLE. JIM RUN MINE

Analyses 81484 to 81486 (p. 81). A drift mine 1 mile west of Ohiopyle, on the B. & O. R. R. Lower Kittanning coal. Roof, shale; floor, bone. Cover at point of sampling, 150 feet. Sampled at two points by E. G. Hill on September 2, 1921.

Sections of coal bed in Jim Run mine

Section	A		B	
Laboratory No.	81484		81485	
	Ft.	in.	Ft.	in.
Roof coal*		6		6
Draw slate*		8		6
Coal	------	------		11
Sulphur*	------	------		2
Coal	1	3	1	4
Bone*		2		3
Coal		8		5
Thickness of bed	3	3	4	1
Thickness of sample	1	11	2	8

*Not included in sample.

Coal is shot off the solid. At the time of sampling the daily output was 100 tons.

OHIOPYLE. STULL MINE

Analyses 81357 to 81359 (p. 81). A drift mine 3 miles north of Ohiopyle on the B. & O. R. R. Brookville coal. Level. Roof, sandstone; floor, hard blue clay. Sampled at two points by L. D. Woodworth on September 2, 1921.

Sections of coal bed in Stull mine

Section	A		B	
Laboratory No.	81357		81358	
	Ft.	in.	Ft.	in.
Coal*		2	------	------
Bony coal*		6		3
Coal		2		5
Slate and sulphur		½		¼
Coal		1		6
Slate and sulphur		¼		¼
Coal		8½	1	
Slate and sulphur		¼		⅛
Coal		4		8⅜
Slate and sulphur*		½		1
Coal		9¼	------	------
Slate*		1	------	------
Coal*		2		2
Thickness of bed	3	1¼	3	2
Thickness of sample	2	1¾	2	8

*Not included in sample.

Monobel, a permissible exposive, is used. At the time of sampling the daily output was 30 tons, all from advance workings. Coal is picked on car, and all is run-of-mine. This mine was but recently opened, and they expect to mine 200 tons a day.

OHIOPYLE. COUNTRY BANK

Analysis 81356 (p. 81). J. F. Stull country bank, a drift mine 3 miles north of Ohiopyle. Lower Freeport coal; level. Thickness of bed, coal, and sample, 14 inches. Cover at point of sampling, 20 feet. Roof, slate; floor, clay. Sampled on September 2, 1921, by L. D. Woodworth. This mine was sampled because of apparent excellent quality of coal. All coal is from advance workings.

OHIOPYLE. TORRENCE MINE

Analyses 81360 to 81362 (p. 81). A drift mine 1300 feet above sea level, 3 miles southwest of Ohiopyle on the Western Maryland R. R. Upper Kittanning coal. Level. Roof, hard shale; floor, hard, smooth shale. Sampled at two points on September 3, 1921, by L. D. Woodworth.

Sections of coal bed in Torrence mine

Section	A		B	
Laboratory No.	81360		81361	
	Ft.	in.	Ft.	in.
Bony coal*		3		
Bone				¼
Coal		11	2	2
Sulphur*		½		
Slate				¼
Coal		5½		2
Sulphur*		½		
Slate*				½
Coal		3		1
Mother coal		¼		
Coal		9		
Bony coal		¼		
Coal		3		
Thickness of bed	3	0	2	6
Thickness of sample	2	8	2	5¼

*Not included in sample.

Coal is undercut by machine: Monobel, a permissible explosive, is used. At the time of sampling the daily output was 100 tons, all from advance workings. Coal is picked on car. The output in 1920 was 30,000 tons. In 1921 the life of mine was estimated to be 50 years.

OLIPHANT FURNACE. OLIPHANT MINE

Analyses 84880 to 84884 (p. 81). A slope mine 1172.4 feet above sea level, at Oliphant Furnace on the P. R. R. Pittsburgh coal. Dip, N. W.; strike N. 10° E. Roof, shale; floor, fireclay. Sampled at four points on March 24, 1922, by L. D. Woodworth.

Sections of coal bed in Oliphant mine

Section	A		B		C		D	
Laboratory No.	84880		84881		84882		84883	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	5	1	8	1	8	2	0
Shale		⅛		¼	*	½	*	½
Coal		4		4	2	0	1	9
Shale	*	½		¼	*	½	*	½
Coal	2	0	1	8½		5		5
Shale	*	½		¼	*	½	*	½
Coal		4		4½	3	4	3	4
Shale*		½		½	----	----	----	----
Coal	3	5	3	8	----	----	----	----
Thickness of bed	7	7⅝	7	10¼	7	6½	7	7½
Thickness of sample	7	6⅛	7	9¾	7	5	7	6

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 700 tons. All coal is run-of-mine; the percentage of the coal that is coked varies.

OLIPHANT FURNACE. JEFFREY NO. 1 MINE

Analyses 84843 to 84846 (p 81). A drift mine about 1100 feet above sea level 1 mile west of Oliphant Furnace, on the P. R. R. Sewickley coal. Strike, northeast; dip, northwest. Roof and floor, shale. Sampled at three points by L. D. Woodworth on March 23, 1922.

Sections of coal in Jeffrey No. 1 mine

Section	A		B		C	
Laboratory No.	84843		84844		84845	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal and shale*	----	----	----	----		5
Coal	----	----	----	----		5
Shale	----	----	----	----		¼
Coal		7		9½		4½
Shale		½*		¼		¼
Coal	1	1	1	3		9½
Coal and shale*		5		3		5
Coal	2	1	2	5	2	5
Thickness of bed	4	2½	4	8¾	4	10½
Thickness of sample	3	9	4	5¾	4	½

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 450 tons, 20 per cent from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 5 years.

POINT MARION. FREDERICK NO. 1 MINE

Analyses 84593 to 84596 (p. 82). A drift mine 250 feet above and 1 mile southeast of B. & O. station at Point Marion, on the B. & O. R. R. Pittsburgh coal. Level. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on March 3, 1922.

Sections of coal bed in Frederick No. 1 mine

Section	A		B		C	
Laboratory No.	84593		84594		84595	
	Ft.	in.	Ft.	in.	Ft.	in.
Roof coal (bony)*	1	6	1	6	1	6
Coal		3		5		6
Shale*		½				½
Bony coal*				½		
Coal	2	2½		5½	1	8½
Bony coal*		½				½
Shale*				½		
Coal	3		1	11	3	0
Bony coal*				½		
Coal			2	5		
Sulphur*				½		
Coal				6		
Thickness of bed	7	½	7	4½	6	9½
Thickness of sample	5	5½	5	8½	5	2½

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 250 tons, all from advance workings. All coal is run-of-mine, and is picked on car. In 1922 the life of mine was estimated to be 100 years.

POINT MARION. WINSTEAD MINE

Analyses 84529 to 84532 (p. 82). A drift mine about 230 feet above Poland Station, 2 miles north Point Marion. Coal is shipped entirely by river. Pittsburgh coal. General dip toward northwest. Roof, sandstone; floor, clay. Sampled at three points by L. D. Woodworth on March 2, 1922.

Sections of coal bed in Winstead mine

Section	A		B		C	
Laboratory No.	84529		84530		84531	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		7		5	1	0
Bony coal*	1	4	1	2		7
Coal	1	4	1	4	1	4
Coal and shale*		1		1		½
Coal		4		3		4
Coal and shale*		1		1		½
Coal	1	4	1	5	1	6
Bony coal*		½		½		½
Coal	2	3	2	0	2	1
Bony coal*				1		
Coal				3		
Thickness of bed	7	4½	7	1½	6	11½
Thickness of sample	5	10	5	8	5	3

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 300 tons, all run-of-mine. Coal is picked on car. In 1922 the life of mine was estimated to be 30 years.

REVERE (ULEDI P. O.) BEAL MINE

Analyses 84893 to 84895 (p. 82). A drift mine about 1150 feet above sea level, at Revere (Uledi P. O.), on the P. R. R. Pittsburgh coal. Dip, southeast; strike northeast. Roof, shale; floor, clay. Sampled at two points by L. D. Woodworth on March 27, 1922.

Sections of coal bed in Beal mine

Section	A		B	
Laboratory No.	84893		84894	
	Ft.	in.	Ft.	in.
Roof coal*	1	0	1	0
Coal		9		7
Shale		¼		¼
Coal	2	8½		9
Shale*		½		½
Coal		5	1	11
Shale*		½		½
Coal	3	4		5
Shale	----	----		¼
Coal	----	----		2
Shale	----	----		¼
Coal	----	----	1	3
Shale	----	----		¼
Coal	----	----	2	1
Thickness of bed	8	3¾	8	4
Thickness of sample	7	2¾	7	3

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 10 tons, all run-of-mine. In 1922 the life of mine was estimated to be 2 years.

REVERE (ULEDI P. O.) PLAYFORD MINE

Analyses 84889 to 84892 (p. 82). A slope mine about 1130 feet above sea level, ¼ mile east of Revere, on the P. R. R. Sewickley coal. Dip, southeast; strike, northeast. Roof, fireclay; floor, shale. Sampled at three points by L. D. Woodworth on March 27, 1922.

Sections of coal bed in Playford mine

Section	A		B		C	
Laboratory No.	84889		84890		84891	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		6		3		5
Coal	3	0	3	4	3	6
Coal and shale*		4	----	----		3
Shale*	----	----		½	----	----
Coal	1	8		4	1	8
Shale*	----	----		½	----	----
Coal	----	----	1	4	----	----
Thickness of bed	5	6	5	4	5	10
Thickness of sample	4	8	5	0	5	2

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. All coal is run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 10 years. The mine was being cleaned up preparatory to shipping coal, having been idle for some time. An output of 125 tons a day was expected.

REVERE (ULEDI P. O.) PLAYFORD MINE

Analyses 81552 to 81554 (p. 83). A drift mine ½ mile east of Revere, on the P. R. R. Sewickley coal; dip, 5 degrees southeast. Roof, clay-shale; floor, fireclay. Cover at point of sampling, 150 to 175 feet. The bed was sampled at two points on September 12, 1921, by E. G. Hill.

Sections of coal bed in Playford mine

Section	A		B	
Laboratory No.	81552		81553	
	Ft.	in.	Ft.	in.
Coal	2	11	2	10
Binder		¾		½
Coal	2	0	2	0
Thickness of bed	4	11¾	4	10½
Thickness of sample	4	11¾	4	10½

Coal is shot off the solid, permissible explosives being used. At the time of sampling the daily output was 100 tons, 50 per cent from advance workings. All coal is run-of-mine.

RODGERS MILLS. RODGERS NO. 2 MINE

Analyses 81475 to 81477 (p. 83). A drift mine at Rodgers Mills, on the I. C. V. R. R. Upper Kittanning coal. Roof, slate; floor, fireclay. Cover at point of sampling, 75 to 100 feet. The bed was sampled at two points by E. G. Hill on September 11, 1921.

Sections of coal bed in Rodgers No. 2 mine

Section	A		B	
Laboratory No.	81475		81476	
	Ft.	in.	Ft.	in.
Bone		1		
Coal	4	0	2	11
Thickness of bed	4	1	2	11
Thickness of sample	4	1	2	11

Coal is shot off the solid, permissible explosives being used. At the time of sampling the daily output was 50 tons. All coal is run-of-mine.

RODGERS MILLS. ROSE MINE

Analyses 81481 to 81483 (p. 83). A drift mine ¼ mile east of Rodgers Mills. Lower Kittanning coal. Roof, slate; floor, fireclay. Cover at point of sampling, 75 feet. The bed was sampled at two points by E. G. Hill on September 1, 1921.

Sections of coal bed in Rose mine

Section	A		B	
Laboratory No.	81481		81482	
	Ft.	in.	Ft.	in.
Coal	1	3	1	3
Parting*		8		8
Bony coal	2	0		
Coal			1	9
Thickness of bed	3	11	3	8
Thickness of sample	3	3	3	0

*Not included in sample.

Coal is shot off the solid, and all is run-of-mine.

RODGERS MILLS. GRIMES MINE

Analyses 81478 to 81480 (p. 83). A drift mine 2½ miles south of Rodgers Mills, on the I. C. V. R. R. Lower Freeport coal. Roof, good sandstone; floor, smooth fireclay. Cover at point of sampling, 50 to 75 feet. Sampled at two points by E. G. Hill on September 11, 1921.

Sections of coal bed in Grimes mine

Section	A		B	
Laboratory No.	81478		81479	
	Ft.	in.	Ft.	in.
Coal	3	0	2	10
Bone*		1½		3
Coal	1	5	1	3
Bone*		3	---	---
Binder*	---	---		1½
Coal		7		3
Thickness of bed	5	4½	4	7½
Thickness of sample	5	0	4	3

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the output was variable, all being run-of-mine from advance workings.

SAND ROCK STATION. CORRADO NO. 2 MINE

Analyses 85331 to 85334 (p. 83). A drift mine about 875 feet above sea level, ½ mile southeast of Sand Rock Station, on the P. & L. E. R. R. Upper Kittanning coal. Dip, southeast; strike, northeast. Roof, sandstone; floor, fireclay. Sampled at three points by L. D. Woodworth on April 5, 1922. Samples were taken of the whole bed which is coal free from partings. The bed measured 35 inches in the 1st left heading, and 30 inches in the 2nd left and main headings.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 175 tons, all from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 25 years.

SMITHFIELD. BAXTER RIDGE NO. 2 MINE

Analyses 84643 to 84646 (p. 83.) A drift mine 3½ miles west of Smithfield, on the B. & O. R. R. Pittsburgh coal. Level except for local swamps. Roof, shale; floor, hard clay. Sampled at three points by L. D. Woodworth on March 9, 1922.

Sections of coal bed in Baxter Ridge No. 2 mine

Section	A		B		C	
Laboratory No.	84643		84644		84645	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		2		6	1	0
Coal		5		2		4
Shale*		1		1	---	---
Bony coal*	---	---	---	---		6
Coal		3½		4		11
Bony coal*		1		½		½
Coal		3½		3	1	9
Bony coal*		1		1		1
Coal		10		1	2	2
Bony coal*		½		½	---	---
Coal		4		9	---	---
Bony coal*		½		1	---	---
Coal	1	5	2	0	---	---
Bony coal*		1		1	---	---
Coal	2	4	2	5	---	---
Thickness of bed	6	6	6	11	6	9½
Thickness of sample	5	11	6	0	5	2

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 100 tons, all run-of-mine, from advance workings. Coal is picked on car. In 1922 the life of mine was estimated to be 8 years. Property covers 15 acres.

SMITHFIELD. SAPPER MINE

Analyses 84410 to 84414 (p. 83). A drift mine about 1140 feet above sea level, 4 miles north of Smithfield on the B. & O. R. R. Sewickley coal. Dip, about 5 per cent; strike, N. 30° E. Roof, shaley sandstone or sand rock; floor, fireclay. Sampled at 4 point by L. D. Woodworth on February 22, 1922.

Sections of coal bed in Sapper mine

Section	A		B		C		D	
Laboratory No.	84410		84411		84412		84413	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*								1
Coal								8
Shale								¼
Coal	2	9	3	1	2	7½	1	7
Slate		⅛						
Shale*						½		½
Coal		2				7		6
Shale		⅛						
Bony coal*				½		½		½
Coal	2	0	2	1	2	0	1	9
Shale*								½
Coal (floor)*								4
Thickness of bed	4	11¼	5	2½	5	3½	5	¾
Thickness of sample	4	11¼	5	2	5	2½	4	6¼

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 600 tons, 80 per cent from advance workings. All coal is run-of-mine, and is picked on car. In 1922 the life of mine was estimated to be 35 years. Coal occurs in several hills (400 acres), but is cut out in valleys. There are about 6 drift openings, but they do not have separate names and are considered as different sections of the same mine.

SOMERFIELD. THOMASDALE MINE

Analyses 81353 to 81355 (p. 84). A slope mine ¼ mile west of Somerfield, on a branch of the B. & O. R. R. Upper Freeport coal. Level. Roof, slate; floor, hard limstone. Sampled at two points by L. D. Woodworth on September 1, 1921.

Sections of coal bed in Thomasdale mine

Section	A		B	
Laboratory No.	81353		81354	
	Ft.	in.	Ft.	in.
Coal	1	3	1	3
Bone*		1		2
Coal	1	2	1	4½
Clay*	1	0	1	5
Bone*		2		½
Coal	1	9	1	3
Slate*		1		1
Coal*		4		4
Thickness of bed	5	10	5	11
Thickness of sample	4	2	3	10½

*Not included in sample.

Coal is undercut by machine; Monobel, a permissible explosive, is used. At the time of sampling the daily output was 110 tons, all run-of-mine, from advance workings. Coal is picked on car.

STEWARTON. STEWARTON MINE

Analyses 81342 to 81344 (p. 84). A drift mine about 100 feet above B. & O. R. R., ½ mile east of Stewarton. Clarion coal. Roof, shale; floor, fireclay. Cover at point of sampling, 100 feet. Sampled at two points by E. G. Hill on August 30, 1921.

Sections of coal bed in Stewarton mine

Section	A		B	
Laboratory No.	81342		81343	
	Ft.	in.	Ft.	in.
Coal*		7		
Roof coal				8
Draw slate*		7		7
Coal		4		3
Bone binder*		3		3
Coal	1	9	3	4
Bone binder*		2		
Coal	1	11		
Thickness of bed	5	7	5	1
Thickness of sample	4	0	4	3

*Not included in sample.

Coal is undercut by hand, and all is run-of-mine. At the time of sampling the daily output was 50 tons. In 1921 the life of mine was estimated to be "long."

UNIONTOWN. EVANS NO. 3 MINE

Analyses 85318 to 85321 (p. 84). A slope mine about 1030 feet above sea level, 2 miles northeast of Uniontown at Evans Station on the P. R. R. Sewickley coal. Dip, northwest; strike, northeast. Roof and floor, shale. Sampled at three points by L. D. Woodworth on March 30, 1922.

Sections of coal bed in Evans No. 3 mine

Section	A		B		C	
Laboratory No.	85318		85319		85320	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		6		6		6
Coal		11	1	7	1	2
Shale		¼	*	½		⅛
Coal		5	1	9		5
Shale	*	½				⅛
Coal and shale*				4		
Coal	1	6	1	1	1	8
Shale		¼				
Coal and shale*						3
Coal		4			1	2
Coal and shale*		4				
Coal	1	3				
Thickness of bed	5	4	5	3½	5	2¼
Thickness of sample	4	5½	4	5	4	5¼

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 450 tons, 90 per cent from advance workings. Coal is picked on car. A ¾ inch bar screen is used; sizes produced, lump and slack. In 1922 the life of mine was estimated to be 50 years.

UNIONTOWN. SPRINGER MINE

Analyses 84949 to 84951 (p. 84). A drift wagon mine about 1300 feet above sea level 3 miles east of Uniontown on western slope of Chestnut ridge. Upper Freeport coal. Dip, 15 degrees northwest; strike, northeast. Roof and floor, shale. Sampled at two points by L. D. Woodworth on March 28, 1922.

Sections of coal in Springer mine

Section	A		B	
Laboratory No.	84949		84950	
	Ft.	in.	Ft.	in.
Coal	1	4	1	5
Sulphur	*	½		¼
Coal	1	4	1	7
Clay*		3		4
Coal		5		5
Clay*		4		
Coal and clay*				1
Coal		5		6
Coal and clay*		1		
Coal		5		
Thickness of bed	4	7½	4	4¼
Thickness of sample	3	11	3	11¾

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 35 tons, all run-of-mine and from advance workings. Coal is picked on car. In 1922 the life of mine was estimated to be 15 years.

WALTERSBURG. VALLEY MINE

Analyses 84988 to 84990 (p. 84). A drift mine about 960 feet above sea level. ½ mile southeast of Waltersburg, on the P. R. R. Gallitzin coal. Dip, northwest; strike, northeast. Roof, shale; floor, fireclay. Sampled at two points on March 29. 1922 by L. D. Woodworth.

Sections of coal bed in Valley mine

Section	A		B	
Laboratory No.	84988		84989	
	Ft.	in.	Ft.	in.
Coal		9		8
Shale*		½		½
Coal	1	9	2	1
Shale*		½		
Coal		3		
Thickness of bed	2	10	2	9½
Thickness of sample	2	9	2	9

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 10 tons, all run-of-mine and from advance workings. In 1922 the life of mine was estimated to be 10 years.

WALTERSBURG. WALTERS MINE

Analyses 81583 to 81585 (p. 85). A drift mine 1 mile east of Waltersburg on the P. R. R. Hagers coal. Dip, 5 degrees west; strike, north. Roof, shale; floor, fireclay. Cover at point of sampling, 200 to 250 feet. Sampled at two points by E. G. Hill on September 14, 1921.

Sections of coal bed in Walters mine

Section	A		B	
Laboratory No.	81583		81584	
	Ft.	in.	Ft.	in.
Coal		9		9
Binder		3/4		3/4
Coal	2	2	2	2
Thickness of bed	2	11 3/4	2	11 3/4
Thickness of sample	2	11 3/4	2	11 3/4

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 40 tons, all run-of-mine.

WALTERSBURG. WALTERSBURG MINE

Analyses 81561 to 81563 (p. 85). A drift mine one mile south of Waltersburg on the P. R. R. Pittsburgh coal. Strike, north. Roof, slate or bone; floor, slate and hard shale. Cover at point of sampling, 350 to 400 feet. Sampled at two points by E. G. Hill on September 14, 1921.

Sections of coal bed in Waltersburg mine

Section	A		B	
Laboratory No.	81561		81562	
	Ft.	in.	Ft.	in.
Coal	5	3	5	4
Parting		3/4		1/2
Coal	3	0	3	1/2
Thickness of bed	8	3 3/4	8	5
Thickness of sample	8	3 3/4	8	5

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 350 tons, all run-of-mine. All coal is coked in 150 beehive ovens. The life of mine in 1921 was estimated at 5 years.

GREENE COUNTY

BESCO. WILLIAM PITT MINE

Analyses 83976 to 83980 (p. 85). A slope mine 779 feet above sea level, at Besco, on the P. R. R. Pittsburgh coal. Dip, southwest. Roof, slate; floor, hard clay. Sampled at four points by L. D. Woodworth on January 27, 1922.

Sections of coal bed in William Pitt mine

Section	A		B		C		D	
Laboratory No.	83976		83977		83978		83979	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal	3	5 1/2	3	8	3	10	3	9
Slate*		1/2		1/2		1/2		1/2
Coal		3		3		3		3
Slate*		1/2		1/2		1/2		1/2
Coal	2	7	2	6 1/2	2	3	2	4
Floor coal*		4		4		3	----	----
Thickness of bed	6	8 1/2	6	10 1/2	6	8	6	5
Thickness of sample	6	3 1/2	6	5 1/2	6	4	6	4

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 1,100 tons, all run-of-mine and from advance workings. Coal is screened through ¾ inch screens. In 1922 the life of mine was estimated to be 50 years.

CLARKSVILLE. EDWARD MINE

Analyses 83846 to 83849 (p. 85). A shaft mine 133 feet deep, and 819 feet above sea level. ½ mile west of Clarksville on the P. R. R. Pittsburgh coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on January 18, 1922.

Sections of coal bed in Edward mine

Section	A		B		C	
Laboratory No.	83846		83847		83848	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	3	5	3	5	3	4
Slate*		½		¼		¼
Coal		2		2		3
Slate*		¼		¼		¼
Coal	3	0	2	7	2	7
Floor coal*		6		6	1	0
Thickness of bed	7	1¾	6	8½	7	2½
Thickness of sample	6	7	6	2	6	2

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output of the mine was 200 tons, all run-of-mine and from advance workings. This mine had just been opened, and ¾-inch screens were soon to be installed. In 1922 the life of mine was estimated to be 50 years.

CRUCIBLE. CRUCIBLE MINE

Analyses 84169 to 84175 (p. 85). A shaft mine 150 feet deep, and 791 feet above sea level, at Crucible, on the P. R. R. Pittsburgh coal. Roof, slate; floor, hard clay. Sampled at six points by L. D. Woodworth on February 6, 1922.

Sections of coal bed in Crucible mine

Section	A		B		C		D		E		F	
Laboratory No.	84169		84170		84171		84172		84173		84174	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	5½	3	6	1	6	3	10½	4	3	5	1
Slate	*	1						¼		¼		⅛
Bony coal*				3								
Sulphur*						½						
Coal	1	9		2	2	8		2½	2	2		4
Slate		½	*	½		¼		¼				¼
Coal	2	5½	2	8	2	2	2	3			1	3
Floor coal*	1	0	1	0	1	0	1	0	1	0	1	0
Thickness of bed	7	9¼	7	7½	7	4¾	7	5½	7	5¼	7	8⅜
Thickness of sample	6	8¼	6	4	6	4¼	6	5½	6	5¼	6	8⅜

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 1500 tons, 85 per cent being from advance workings. All coal is run-of-mine; ¾-inch screens are used. In 1922 the life of mine was estimated to be 50 years.

GRAYS LANDING. ALICIA No. 2 MINE

Analyses 84203 to 84208 (p. 86). A drift mine 823 feet above sea level, ½ mile south of Grays Landing. Pittsburgh coal. General dip to north. Roof, shale; floor, hard clay. Sampled at five points by L. D. Woodworth on February 13, 1922.

Sections of coal bed in Alicia No. 2 mine

Section	A		B		C		D		E	
Laboratory No.	84203		84204		84205		84206		84207	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Roof coal*		8		8	----	----	----	----		6
Coal	3	11	1	1	3	3	2	4	1	8
Bony coal* or slate		½		⅛		½		1		1
Coal		4	2	1	1	0	1	10⅛	2	3
Slate*		½		½		½		½		½
Coal		11		4		4		3	1	4
Bony coal or slate*		½		½		½		½		½
Coal	1	10	3	2	2	9	2	5		10
Floor coal*	----	----		4		3		4		6
Thickness of bed	7	9½	7	9⅛	7	8½	7	4⅛	7	3
Thickness of sample	7	0	6	8	7	4	6	10⅛	6	1

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 1,200 tons, 92 per cent from advance workings; 10 per cent of coal is run-of-mine. Coal is screened with ¾-inch screens for slack, 2 inch screens for nut. The mine is also equipped for crushing to ¾ inch. In 1922 the life of mine was estimated to be 35 years.

GRAYS LANDING. NEAR ALICIA No. 2 MINE

Analyses 84246 to 84248 (p. 86). A drift about 875 feet above sea level, ½ mile south of Grays Landing. Output goes to Alicia No. 2 boiler house. Sewickley coal. General dip to north. Roof. sandstone; floor, shale. Sampled on February 14, 1922, by L. D. Woodworth.

Sections of coal bed from near Alicia No. 2 mine

Section	A		B	
Laboratory No.	84246		84247	
	Ft.	in.	Ft.	in.
Bony coal*		2		2
Coal		6		6
Slate	*	½		⅛
Coal	2	0	2	4
Bony coal*		3		2
Slate		½	----	----
Coal	1	9	1	9
Slate*		1	----	----
Coal		2	----	----
Thickness of bed	5	0	4	11⅛
Thickness of sample	4	5	4	7⅛

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. At the time of sampling the daily output was 40 tons, all run-of-mine and from advance workings. In 1922 the life of mine was estimated to be 40 years.

JEFFERSON. FULTON COUNTRY BANK

Analysis 83751 (p. 86). A wagon drift mine. Waynesburg coal. Roof, slate; floor, fireclay. Sampled at one point by L. D. Woodworth on January 12, 1922

Section of coal bed in Fulton country bank

Laboratory No.	83751	
	Ft.	in.
Roof coal*		10
Slate*		2
Coal	2	3
Clay*	1	5
Coal	1	8
Coaly shale*		2
Coal	1	2½
Bottom coal*		2
Thickness of bed	7	10½
Thickness of sample	5	1½

*Not included in sample.

Coal is undercut by hand. All coal is run-of-mine, from advance workings. The property consists of 5 acres.

JEFFERSON. ROGERS MINE

Analyses 83752 to 83753 (p. 86). A drift mine. 975 feet above sea level, ¾ mile north of Jefferson. Waynesburg coal. Roof, slate; floor, fireclay. Sampled at one point on January 12, 1922, by L. D. Woodworth.

Sections of coal bed in Rogers country bank

Upper Bench (Lab. No. 83752)	Ft.	in.
Roof coal*		8
Slate*		3
Bony coal*		2
Coal		10
Bony coal		¼
Coal	1	2
Lower Bench (Lab. No. 83753)		
Clay*		4
Bony coal		3
Coal	1	6
Bony coal		¾
Coal		3
Coaly shale*		6
Coal	1	0
Slate*		2
Bottom coal*		8
Thickness of entire bed	7	9½
Thickness of sample	4	9½

*Not included in sample.

Coal is undercut by hand, and is all run-of-mine, from advance workings. Property covers 350 acres.

MATHER. MATHER No. 1 MINE

Analyses 83771 to 83777 (p. 86). A shaft mine 348 feet deep, and 947 feet above sea level, at Mather, on the P. R. R. Pittsburgh coal. Slight dip to southwest. Roof and floor, slate. The bed was sampled at six points by L. D. Woodworth on January 13, 1922.

Sections of coal bed in Mather mine

Section	A		B		C		D		E		F	
Laboratory No.	83771		83772		83773		83774		83775		83776	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		4		3½		5				3		3
Coal	2	5	2	6	3	2	2	5½	3	1	1	5
Bony coal*		1										
Slate			*	½		¼		¼				
Mother coal												¼
Coal		8		7½		3		2			1	10
Slate	*	½	*	½	*	½	*	½		¼		¼
Coal		2		3		8		8		2		2
Slate			*	½		¼		¼		¼	*	½
Coal	2	10	2	7½	2	5½	2	0	2	10	2	4½
Bottom coal*		4										
Thickness of bed	6	11	6	4¾	7	½	5	4½	6	4½	6	1½
Thickness of sample	6	1	6	¼	6	6½	5	4	6	1½	5	10

*Not included in sample.

The mine is worked on the panel system. Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 2300 tons, 95 per cent from advance workings. All coal is run-of-mine; ¾ inch screens are used. Coal is picked on tables. Area of property, 4,500 acres. In 1922 the life of mine was estimated to be 25 years.

NEMACOLIN. NEMACOLIN MINE

Analyses 84162 to 84168 (p. 87). A slope mine 270 feet deep, 830 feet above sea level, at Nemacolin on the P. R. R. Pittsburgh coal. Dip, southwest. Roof, shale; floor, clay. Sampled at six points by L. D. Woodworth on February 9, 1922.

Sections of coal bed in Nemacolin mine

Section	A		B		C		D		E		F	
Laboratory No.	84162		84163		84164		84165		84166		84167	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Roof coal*				6		8		6		8	1	4
Coal	3	1	1	11	3	5	1	1	1	8	2	0
Slate		¼		⅛		¼		*½		¼		¼
Coal		5	1	8½	1	6	1	2	2	5	1	5
Slate		¼		⅛		¼		¼		¼		¼
Coal	2	4		8½	1	1		5		4		4
Slate		¼		¼				⅛		*½		*1
Coal		10		3			1	1	2	0	2	0
Slate		¼		¼			*	1				
Coal	1	3	2	2			2	1				
Floor coal*		6		6		6		4		4		
Thickness of bed	8	6	7	9¾	7	2½	6	9⅞	7	6	7	2½
Thickness of sample	8	0	6	9¾	6	½	5	10⅜	6	5½	5	9½

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 2,000 tons, all run-of-mine and from advance workings. It was intended to equip mine screens later and use shafts to handle coal. The expected output was 4,000 tons. In 1922 the life of mine was estimated to be 75 years.

POINT MARION. JEANNETTE MINE

Analyses 84475 to 84478 (p. 87). A drift mine 1151 feet above sea level, ½ mile southwest of Point Marion, on the M. R. R. Pittsburgh coal. General dip N. 37° W. Roof, shale, sandstone; floor, fireclay. Sampled at three points by L. D. Woodworth on February 28, 1922.

Sections of coal bed in Jeannette mine

Laboratory No.	A 84475		B 84476		C 84477	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal*		6				
Coal and clay*				7		
Bony coal*		6			1	2
Coal		3		10		3
Bony coal*		1		4		1
Coal		11		3	1	2
Bony coal*		½		½		½
Coal		5	1	0		4
Shale*		½		1		½
Coal		7	1	8		11
Bony coal or shale*		½		1		½
Coal		7	1	10		2
Sulphur		¼			*	½
Coal		3				3
Bony coal*		2				2
Coal	2	3			2	5
Thickness of bed	6	7¾	6	8½	7	1
Thickness of sample	5	3¼	5	7	5	6

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 250 tons, 50 per cent from advance workings. Coal is picked on car; ¾-inch screens are used; sizes produced, lump and slack. In 1922 the life of mine was estimated to be 4 years.

POLAND. DUNKARD No. 1 MINE

Analyses 84521 to 84523 (p. 87). A drift mine 270 feet above and ½ mile south of Poland station on M. R. R. Sewickley coal. General dip, northwest. Roof, shale; floor, fireclay. Sampled at two points on March 1, 1922 by L. D. Woodworth.

Sections of coal bed in Dunkard No. 1 mine

Section Laboratory No.	A 84521		B 84522	
	Ft.	in.	Ft.	in.
Coal	2	8	2	3
Shale and coal*		2		
Bony coal*				2
Coal	1	10	2	0
Shale*		½		
Coal*		3		
Thickness of bed	4	11½	4	5
Thickness of sample	4	6	4	3

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. The average output is about 75 tons per day. Coal is picked on belt. This mine was mostly flooded. In 1922 the life of mine was estimated to be 30 years.

POLAND. DUNKARD No. 2 MINE

Analyses 84524 to 84528 (p. 87). A drift mine 180 feet above and ½ mile south of Poland station on M. R. R. Pittsburgh coal. General dip, northwest. Roof, sandstone; floor, fireclay. Sampled at four points on March 1, 1922, by L. D. Woodworth.

Sections of coal bed in Dunkard No. 2 mine

Section	A		B		C		D	
Laboratory No.	84524		84525		84526		84527	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	3	1	1		10	1	0
Bony coal*		7		10		9	1	0
Coal	1	8	1	7	1	5	1	3
Bony coal*		½		1		½		½
Coal		3		4		5		4
Bony coal*		½	-----	-----	-----	-----		1
Shale*	-----	-----		½		1	-----	-----
Coal	1	4		4	1	7	2	0
Bony coal*		½	-----	-----		1		½
Sulphur*	-----	-----		½	-----	-----	-----	-----
Coal	1	4	1	5	1	9	1	5
Shale*	-----	-----		½	-----	-----	-----	-----
Sulphur	-----	-----	-----	-----		¼	-----	-----
Coal	-----	-----	1	4		10	-----	-----
Thickness of bed	6	6½	7	1½	7	9¾	7	2
Thickness of sample	5	10	6	1	6	10¼	6	0

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 500 tons, 90 per cent from advance workings. Coal is screened with 1¼-inch bar screens, and is picked on belt. Sizes produced are lump and slack. In 1922 the life of mine was estimated to be 20 years.

POLAND. POLAND No. 3 MINE

Analyses 84428 to 84433 (p. 87). A drift mine 912.6 feet above sea level and ½ mile north of Poland station on the M. R. R. Pittsburgh coal. General dip northwest. Roof, shale; floor, fireclay. Sampled at five points by L. D. Woodworth on February 23, 1922.

Sections of coal bed in Poland No. 3 mine

Section	A		B		C		D		E	
Laboratory No.	84428		84429		84430		84431		84432	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Roof coal*	1	0	1	0		9	-----	-----	-----	-----
Bony coal*		½		1		1		6		9
Coal		4	1	11		9		3		3
Bony coal*		½		½	-----	-----		½		1
Shale	-----	-----	-----	-----		¼	-----	-----	-----	-----
Coal	1	0	1	10	1	3		6	1	11
Sulphur	-----	-----	-----	-----	-----	-----		¼	-----	-----
Bony coal*		½		1	-----	-----	-----	-----		2
Shale*	-----	-----	-----	-----		½	-----	-----	-----	-----
Coal		7	2	1	1	10	1	4	1	4
Bony coal*	-----	-----	-----	-----		1		½	-----	-----
Sulphur*	-----	-----	-----	-----	-----	-----	-----	-----		½
Shale*		½	-----	-----	-----	-----	-----	-----	-----	-----
Coal		5	-----	-----	-----	-----		4		1
Bony coal*		½	-----	-----	-----	-----		½		½
Coal	1	7	-----	-----	-----	-----	1	4		4
Bony coal*		1	-----	-----	-----	-----		1		½
Coal	2	2	-----	-----	2	2	1	10	1	6
Thickness of bed	7	4½	7	½	6	11¾	6	3¾	6	6½
Thickness of sample	6	1	5	10	5	11¼	5	7¼	5	5

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 1,000 tons, all from advance workings; 50 per cent is run-of-mine. Coal is screened with 1¼-inch bar screens and picked on car. Sizes produced, lump and slack. In 1922 the life of mine was estimated to be 20 years.

POLAND. ROSEDALE No. 2 MINE

Analyses 84479 to 84482 (p. 88). A drift mine 1010.7 feet above sea level, ½ mile northwest of Poland station, on the M. R. R. Sewickley coal. General dip, northwest. Roof, shale; floor, hard clay. Sampled at three points by L. D. Woodworth on February 25, 1922.

Sections of coal bed in Rosedale No. 2 mine

Section	A		B		C	
Laboratory No.	84479		84480		84481	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal and shale*		5	------	------		4
Bony coal*	------	------		4	------	------
Coal		5	1	9½	2	0
Shale		⅛	------	------	------	------
Bony coal*	------	------		½		½
Coal	------	------		3		3
Bony coal*	------	------		½		1
Coal	3	10	2	2	1	9
Coal and shale*	------	------		5	------	------
Thickness of bed	4	8⅛	5	½	4	5½
Thickness of sample	4	3⅛	4	2½	4	0

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 250 tons, all run-of-mine and from advance workings. Coal is picked on car. In 1922 the life of mine was estimated to be 50 years.

RICES LANDING. DILWORTH MINE

Analyses 83892 to 83897 (p. 88). A shaft mine 160 feet deep, and 20 feet below station at Rices Landing. Pittsburgh coal. Roof, slate; floor, fireclay. Sampled at five points by L. D. Woodworth on January 20, 1922.

Sections of coal bed in Dilworth mine

Section	A		B		C		D		E	
Laboratory No.	83892		83893		83894		83895		83896	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal	3	9	3	9	3	5	3	8	3	11
Slate		¼		¼		⅛		¼	*	½
Coal		2		3		4		3		4
Slate	*	½		¼		¼		¼	*	½
Coal	1	5½	1	6	2	9	2	7	2	8
Slate	*	½		¼	------	------	------	------	------	------
Coal	1	2	1	1	------	------	------	------	------	------
Floor coal*		4		5		3		5		4
Thickness of bed	6	11¾	7	0¾	6	9⅜	6	11½	7	4
Thickness of sample	6	6¾	6	7¾	6	6⅜	6	6½	6	11

*Not included in sample.

Coal is undercut by machine, and Monobel No. 4, a permissible explosive, is used. At the time of sampling the daily output was 800 tons, all run-of-mine from advance workings. In 1922 the life of mine was estimated to be 50 years.

RICES LANDING. HOGE MINE

Analysis No. 84052 (p. 88). A drift mine or country bank ½ mile west of Rices Landing. Waynesburg coal. Roof, slate; floor, hard clay. Sampled at one point by L. D. Woodworth on February 3, 1922.

Section of coal bed in Hoge mine

Laboratory No.		84052
	Ft.	in.
Coal		5
sulphur*		½
Sulphur*	1	0
Clay*	1	4
Coal	1	10
Slaty coal*		2
Coal		10
Thickness of bed	5	7½
Thickness of sample	4	1

*Not included in sample.

Coal is undercut by hand. All coal is run-of-mine from advance workings.

WAYNESBURG. GUTHRIE MINE

Analyses 83811 to 83813 (p. 88). A drift mine 2 miles southeast of Waynesburg. Waynesburg coal. Roof, sandstone; floor, slate. Sampled at two points by L. D. Woodworth on January 17, 1922.

Sections of coal bed in Guthrie mine

Section	A		B	
Laboratory No.	83811		83812	
	Ft.	in.	Ft.	in.
Coal		11	1	10
Clay*	1	11	1	5
Coal	2	10	2	10
Floor coal*		3		3
Thickness of bed	5	11	6	4
Thickness of sample	3	9	4	8

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 10 tons, all run-of-mine from advance workings. Coal was picked on car. Output in 1921 was 2,300 tons. Property consists of 96 acres. In 1922 the life of mine was estimated to be 20 years.

WAYNESBURG. MOREDOCK MINE

Analyses 83814 to 83816 (p. 89). A drift mine 2 miles southeast of Waynesburg. Waynesburg coal. Roof and floor, slate. Sampled at two points by L. D. Woodworth on January 17, 1922.

Sections of coal bed in Moredock mine

Section	A		B	
Laboratory No.	83814		83815	
	Ft.	in.	Ft.	in.
Coal		3	------	------
Bony coal*	------	------		3
Clay*		1	------	------
Coal	1	8	1	7
Clay*	1	3	1	4
Bony coal*		2		2
Coal	2	3	2	8
Slate*		½	------	------
Coal		5	------	------
Floor coal*		4		4
Thickness of bed	6	5½	6	4
Thickness of sample	4	7	4	3

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 15 tons, all run-of-mine from advance workings. Coal is picked on car. In 1922 the life of mine was estimated to be 2 years.

WAYNESBURG. PRATT HILL MINE

Analysis 83782 (p. 89). A drift mine 4 miles east of Waynesburg. Waynesburg coal. Roof, slate; floor, clay. Sampled at one point by L. D. Woodworth on January 16, 1922.

Section of coal bed in Pratt Hill mine

Laboratory No.	83782	
	Ft.	in.
Coal	1	5
Clay*	1	2
Coal	2	10
Thickness of bed	5	9
Thickness of sample	4	7

*Not included in sample.

The mine is undercut by machine, and coalite explosive is used. At the time of sampling the daily output was 20 tons, all run-of-mine from advance workings. Coal is picked on car. The mine was mostly flooded. Area of property, 73 acres. In 1922 the life of mine was estimated to be 15 years.

INDIANA COUNTY

BLACK LICK. CLAWSON CUSTOM BANK

Analysis 85501 (p. 89). A drift mine 100 feet above water level, 2 miles west of Black Lick. Pittsburgh coal. Dip, southeast; strike, northeast. Roof, shale; floor, clay. Sampled at one point on April 22, 1922, by L. D. Woodworth.

Section of coal bed in Clawson mine

Laboratory No.	85501	
	Ft.	in.
Coal (dull luster)	1	3
Coal (bright luster)	3	6
Shale*		1
Coal	2	4
Thickness of bed	7	2
Thickness of sample	7	1

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. All coal is run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 10 years.

CLARKSBURG. BROWN MINE

Analysis 85582 (p. 89). A drift mine 100 feet above water level, 1½ miles northwest of Clarksburg, on B. R. & P. R. R. Pittsburgh coal. Dip, northwest; strike, northeast. Roof, shale; floor, clay. Sampled at one point by L. D. Woodworth on April 28, 1922.

Section of coal bed in Brown mine

Laboratory No.	85582	
	Ft.	in.
Rooster coal (not mined)*		9
Clay*		10
Coal	2	0
Shale*		3
Coal	2	8
Shale (not mined)*	1	0
Coal (not mined)*	1	6
Thickness of bed	9	0
Thickness of sample	4	8

*Not included in sample.

Coal is undercut by hand, and shot down with black powder and permissible explosives. At the time of sampling the daily output was 25 tons, 75 per cent from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 4 years.

CORAL. CORAL MINE

Analyses 85506 to 85510 (p. 91). A slope mine 1128.6 feet above sea level, ¼ mile east of Coral on the Indiana Branch of the P. R. R. Upper Freeport coal. Dip, northwest; strike, northeast. Roof and floor, shale. Sampled at four points by L. D. Woodworth on April 24, 1922.

Sections of coal bed in Coral mine

Section	A		B		C		D	
Laboratory No.	85506		85507		85508		85509	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Cannel coal*		4		4		5		3
Coal	1	3	1	5	1	6	1	6
Bony streaked coal*		10		11		10		9½
Coal	1	8	3	3		6	3	6
Sulphur*		½				½		
Coal	1	11			2	10		
Thickness of bed	6	½	5	11	6	1½	6	½
Thickness of sample	4	10	4	8	4	10	5	0

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 800 tons, 80 per cent from advance workings; 3 per cent of coal is run-of-mine; 97 per cent is washed and coked in 300 beehive ovens. Coal is crushed by breaker to ½-inch size and bony coal removed. Estimated life in 1922 was 30 years.

DILLTOWN. DILLTOWN SMOKELESS No. 1 MINE

Analyses 85061 to 85064 (p. 91). A drift mine ¼ mile north of Dilltown, on the B. R. & P. and P. R. R. Lower Kittanning coal. Dip, 4 degrees southwest. Roof, slate; floor, hard, smooth slate. Sampled at three points by W. J. Fene (USBM) March 31 and April 1, 1922.

Sections of coal bed in Dilltown Smokeless No. 1 mine

Section	A		B		C	
Laboratory No.	85061		85062		85063	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	0	1	9	2	1½
Slate*		¼		⅛		¼
Coal		5		4½	1	4
Slate*	---	---		¼	---	---
Coal	---	---		10	---	---
Thickness of bed	2	5¼	2	11⅞	3	5¾
Thickness of sample	2	5	2	11½	3	5½

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 700 tons, 75 per cent from advance workings. Coal is screened with shaker screens and picked on belt. In 1922 the life of mine was estimated to be 20 years.

GLEN CAMPBELL. ELECTRIC No. 8 MINE

Analyses 75812 to 75814 (p. 91). A mine at Glen Campbell on the N. Y. C. R. R. Upper Kittanning coal. Roof, slate; floor, shale. Cover at point of sampling 40 to 50 feet. Sampled at two points by E. G. Hill on August 26, 1920.

Sections of coal bed in Electric No. 8 mine

Section	A		B	
Laboratory No.	75812		75813	
	Ft.	in.	Ft.	in.
Dirty coal	1	2	---	---
Cannel coal	---	---		4
Coal	1	6½		5
Dull, hard coal		3	---	---
Bone*	---	---		6
Coal	3	0	1	6
Hard, dull coal	---	---		3
Coal	---	---	3	4
Thickness of bed	5	11½	6	4
Thickness of sample	5	11½	5	10

*Not included in sample.

At the time of sampling the daily output was 200 tons.

GLEN CAMPBELL. FALCON No. 8 MINE

Analysis 75820 (p. 91). A mine one mile east of Glen Campbell on the P. R. R. Middle Kittanning coal. Roof, slate; floor, shale. Cover at point of sampling, 75 feet. Sampled at one point by E. G. Hill on August 27, 1920.

Section of coal bed in Falcon No. 8 mine

Laboratory No.	75820	
	Ft.	in.
Coal		6
Shale*		5
Coal	1	8
Bone*		4
Coal		5
Thickness of bed	3	4
Thickness of sample	2	7

*Not included in sample.

At the time of sampling the daily output was 200 tons.

GLEN CAMPBELL. FALCON No. 9 MINE

Analysis 75821 ((p. 91). A mine one mile east of Glen Campbell on the P. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 45 feet. Sampled at one point by E. G. Hill on August 27, 1920.

Section of coal in Falcon No. 9 mine

Laboratory No.	75821	
	Ft.	in.
Coal	1	9
Bone*		2
Coal		11
Mother of coal		1
Coal	1	1
Thickness of bed	4	0
Thickness of sample	3	10

*Not included in sample.

At the time of sampling the daily output was 200 tons.

GLEN CAMPBELL. HILLSDALE No. 6 MINE

Analysis 75819 (p. 92). A mine 3 miles southwest of Glen Campbell, on the P. R. R. Upper Freeport coal. Roof, slate; floor, shale. Cover at point of sampling, 60 feet. Sampled at one point by E. G. Hill on August 26, 1920.

Section of coal bed from Hillsdale No. 6 mine

Laboratory No.	75819	
	Ft.	in.
Coal	3	7
Bone*		2
Coal		6
Thickness of bed	4	3
Thickness of sample	4	1

*Not included in sample.

At the time of sampling the daily output was 300 tons.

GIPSY. TROJAN MINE

Analysis 75818 (p. 92). A mine ½ mile south of Gipsy, on the P. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 60 feet. Sampled at one point by E. G. Hill on August 26, 1920.

Section of coal bed in Trojan mine

Laboratory No.	75818	
	Ft.	in.
Coal	2	7
Bone*		1
Coal		7
Thickness of bed	3	3
Thickness of sample	3	2

*Not included in sample.

At the time of sampling the daily output was 75 tons.

HOMER CITY. TIDE No. 2 MINE

Analyses 85536 to 85539 (p. 93). A drift mine 1127 feet above sea level, 2 miles east of Homer City, on the B. R. & P. R. R. Lower Kittanning coal. Dip, northwest; strike, northeast. Roof and floor, shale. Sampled at three points by L. D. Woodworth on April 25, 1922.

Sections of coal bed in Tide No. 2 mine

Section	A		B		C	
Laboratory No.	85536		85537		85538	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		2		4		4
Coal	1	11		6	3	4
Sulphur		¼		¼	---	---
Coal	1	6	1	6	---	---
Sulphur	---	---		¼	---	---
Coal	---	---		5	---	---
Sulphur*	---	---		½	---	---
Coal	---	---	1	5	---	---
Thickness of bed	3	7¼	4	3	3	8
Thickness of sample	3	5¼	3	10½	3	4

*Not included in sample.

Coal is undercut by machine, and permissible explosives and black blasting powder are used. At the time of sampling the daily output was 300 tons. All coal is run-of-mine. In 1922 the life of mine was estimated to be 20 years.

JOSEPHINE. BELLS MILL MINE

Analyses 85502 to 85505 (p. 93). A drift mine 1042.3 feet above sea level ½ mile east of Josephine, on the P. R. R. Lower Kittanning coal. Dip, northwest; strike, northeast. Roof and floor, shale. Sampled at three points by L. D. Woodworth on April 21, 1922.

Sections of coal bed in Bells Mill mine

Section	A		B		C	
Laboratory No.	85502		85503		85504	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		5		5		6
Coal	3	3	1	10	3	3½
Sulphur*	---	---		½	---	---
Coal	---	---	1	4	---	---
Thickness of bed	3	8	3	7½	3	9½
Thickness of sample	3	3	3	2	3	3½

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 300 tons, all run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 15 years.

KENT. AULTMAN No. 5 MINE

Analyses 85763 to 85766 (p. 93). A drift mine about 1080 feet above sea level, 2 miles southeast of Kent on the B. R. & P. R. R. Upper Freeport coal. Dip, N. 84° W; strike, N. 6° E. Sampled at three points on May 11, 1922, by L. D. Woodworth.

Sections of coal bed in Aultman No. 5 mine

Section	A		B		C	
Laboratory No.	85763		85764		85765	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*						4
Coal	3	1	3	2	3	0
Bony coal*		1½		2		1
Coal		8		7		9
Thickness of bed	3	10½	3	11	4	2
Thickness of sample	3	9	3	9	3	9

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 800 tons, all run-of-mine. Coal is picked on car. In 1922 the life of mine was estimated to be 50 years.

LOCUST. LOCUST MINE

Analyses 75750 to 75752 (p. 94). A mine ½ mile south of Locust, on the B. R. & P. R. R. Upper Freeport coal. Roof, sandy shale and sandstone; floor, fireclay. Cover at point of sampling, 45 feet. Sampled at two points by E. G. Hill on August 24, 1920. Where sample No. 74750 was cut the bed measured 3 feet 4 inches and sample No. 75751, 3 feet 6 inches of clean coal.

At the time of sampling the daily output was 150 tons.

STRANGFORD. STRANGFORD MINE

Analyses 85657 to 85660 (p. 95). A drift mine about 975 feet above sea level, at Strangford, on the P. R. R. Upper Freeport coal. Dip, northwest; strike, northeast. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on May 3, 1922.

Sections of coal bed in Strangford mine

Section	A		B		C	
Laboratory No.	85657		85658		85659	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal and sulphur*						1
Coal	2	10	2	10	2	9
Bony coal*		1		1		1
Coal		9		8		7
Thickness of bed	3	8	3	7	3	6
Thickness of sample	3	7	3	6	3	4

*Not included in sample.

Coal is undercut by machine, and shot down with black powder and permissible explosives. At the time of sampling the daily output was 150 tons, all run-of-mine from advance workings. In 1922 the life of mine was estimated to be 20 years.

TUNNELTON. TUNNELTON MINE

Analyses 85601 to 85604 (p. 95). A drift mine 904.7 feet above sea level, ½ mile west of Tunnelton on the P. R. R. Upper Freeport coal. Slight dip to southeast; strike, northeast. Roof, shale; floor, shale and fireclay. Sampled at three points by L. D. Woodworth on May 1, 1922.

Sections of coal bed in Tunnelton mine

Section	A		B		C	
Laboratory No.	85601		85602		85603	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	11	1	2½	1	8
Shale	*	½		¼		
Coal and shale*						3
Coal		6		2		4
Shale				¼		
Coal and shale*						7
Coal				3		4
Shale*				¼		
Coal and shale*						7
Coal				6		5
Bony coal*				4		
Coal				8		
Thickness of bed	2	5½	3	2¼	4	2
Thickness of sample	2	5	2	10	2	9

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. A daily output of 150 tons was expected when the mine resumed after being idle for 13 months. In 1922 the life of the mine was estimated to be 15 years.

WHITE STATION. WATSON NO. 1 AND 2 MINE

Analyses 85652 to 85656 (p. 95). A drift mine 900 feet above sea level, at White station on the P. R. R. Upper Freeport coal. Dip, northwest; strike, northeast. Roof, shale; floor, fireclay. Sampled at four points by L. D. Woodworth on May 2, 1922.

Sections of coal bed in Watson No. 1 mine

Section	A		B		C		D	
Laboratory No.	85652		85653		85654		85655	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal, shale and sulphur*		2				2		2
Coal				3				
Sulphur				¼				
Coal	1	0	1	4	2	0	1	11
Bony coal				*½		*½		¼
Sulphur		¼						
Coal		11		5		5		6
Shale*		½						
Bony coal*				½		10		8
Coal		5		5				7
Bony coal*		6						
Sulphur*				½				
Coal		6		6				
Thickness of bed	3	6¼	3	¾	3	5½	3	10¼
Thickness of sample	2	10¼	2	11¼	2	5	3	¼

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 600 tons, 67 per cent from advance workings. All coal is run-of-mine. Coal is picked on belt and car. In 1922 the life of mine was estimated to be 100 years.

JEFFERSON COUNTY

BROCKWAYVILLE. GROVES NO. 1 MINE

Analyses 82574 to 82577 (p. 96). A drift mine 1510 feet above sea level, 1¾ miles south of Brockwayville. Lower Freeport coal. Roof, slate; floor, No. 3 fireclay. Sampled at three points on October 31, 1921, by L. D. Woodworth.

Samples Nos. 82574 and 82576 measured 3 feet 5 inches and Sample No. 72575 measured 3 feet 8 inches of clean coal. The bed is overlain by 3 inches of bony coal which was not included.

Coal is undercut by machine and black powder used; ¾-inch bar screens are used and coal is picked on car. At the time of sampling the daily output was 125 tons, 40 per cent being from advance workings; 90 per cent of coal is run-of-mine. In 1921 the life of mine was estimated to be 2 years.

BROCKWAYVILLE. GROVES NO. 2 MINE

Analyses 82578 to 82581 (p. 96). A drift mine, 1548 feet above sea level, 1¾ miles south of Brockwayville, on the B. R. & P. R. R. Upper Freeport coal. Level. Roof, slate; floor, No. 3 fireclay. Sampled at three points by L. D. Woodworth on October 31, 1921.

Sections of coal bed in Groves No. 2 mine

Section	A		B		C	
Laboratory No.	82578		82579		82580	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	7	2	4½	1	3
Mother coal*		½	------			1
Coal	1	0	------		1	0
Thickness of bed	2	7½	2	4½	2	4
Thickness of sample	2	7	2	4½	2	3

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 100 tons, 75 per cent being from advance workings; 90 per cent of coal is run-of-mine; ¾-inch bar screens are used. Coal is picked on car. In 1921 the life of mine was estimated to be 2 years.

BROOKVILLE. MINEWEASER COUNTRY BANK

Analyses 82788 to 82790 (p. 96). A drift mine 4 miles north of Brookville. Brookville coal; level. Roof and floor, slate. Sampled at two points by L. D. Woodworth on November 9, 1921.

Sections of coal bed in Mineweaser bank

Section	A		B	
Laboratory No.	82788		82789	
	Ft.	in.	Ft.	in.
Coal		2		1
Bony coal*		1		2
Coal		4	------	
Sulphur		¼	------	
Coal	2	0	2	3
Bony coal*		1		½
Coal		3		3
Thickness of bed	2	11¼	2	9½
Thickness of sample	2	9¼	2	7

*Not included in sample.

Coal is undercut by hand. At the time of sampling the daily output was 10 tons, all being run-of-mine and from advance workings. Property consists of 20 acres.

COAL GLEN. NO. 8 JEFFERSON MINE

Analyses 82590 to 82593 (p. 96). A drift mine 15 feet below station at Coal Glen, on B. R. & P. R. R. Lower Freeport coal. Local dips. Roof, slate; floor, hard clay. Sampled at three points by L. D. Woodworth on November 2, 1921.

Sections of coal bed in No. 8 Jefferson mine

Section	A		B		C	
Laboratory No.	82590		82591		82592	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		3		3		3
Coal		6	1	10		5
Bony coal*		1		1		1
Coal	3	8	1	6	1	6
Bony coal*	---	---	---	---		½
Coal	---	---	---	---	1	8½
Thickness of bed	4	6	3	8	4	0
Thickness of sample	4	2	3	4	3	7½

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 350 tons, all run-of-mine from advance workings. Coal is picked on car. In 1921 the life of mine was estimated to be 5 years.

CONIFER. CONIFER MINE

Analyses 34910 to 34912 (p. 97). A mine at Conifer on the P. & S. R. R. Brookville coal. Roof, sandstone; floor, slate. Cover at point of sampling, 75 feet. Sampled at two points by E. G. Hill on July 14, 1920.

Sections of coal bed in Conifer mine

Section	A		B	
Laboratory No.	34910		34911	
	Ft.	in.	Ft.	in.
Coal		11		11
Bone*		7		8
Coal	3	3	3	2
Thickness of bed	4	9	4	9
Thickness of sample	4	2	4	1

*Not included in sample.

At the time of sampling the daily output was 600 tons.

DORA. DORA MINE

Analyses 81572 to 81574 (p. 97). A drift mine 1370 feet above sea level, at Dora, on the P. & S. R. R. Lower Kittanning coal. Slight dip to northeast. Roof, slate; floor, fireclay. Cover at point of sampling, 50 to 60 feet. Sampled at two points on September 17, 1921, by L. D. Woodworth.

Sections of coal bed from Dora mine

Section	A		B	
Laboratory No.	81572		81573	
	Ft.	in.	Ft.	in.
Slate*		½		½
Coal	3	½	1	2
Bony coal*				½
Coal			1	6½
Sulphur*				½
Coal				2
Thickness of bed	3	1	3	0
Thickness of sample	3	½	2	10½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 75 tons, all run of mine from advance workings.

FROSTBURG. DENNISON MINE

Analyses 81505 to 81507 (p. 97). A drift mine 1550 feet above sea level, one mile west of Frostburg, on B. R. & P. R. R. Upper Freeport coal; level. Roof, slate; floor fireclay. Cover at point of sampling, 50 feet. Sampled at three points on September 12, 1921, by L. D. Woodworth.

Sections of coal bed in Dennison mine

Section	A		B		C	
Laboratory No.	81505		81506		81507	
	Ft.	in.	Ft.	in.	Ft.	in.
Bone*		½		½		1
Coal	3	4½	4	6½	3	4½
Mother coal		½				½
Coal	1	3			1	6
Thickness of bed	4	8½	4	7	5	0
Thickness of sample	4	8	4	6½	4	11

*Not included in sample.

Permissible explosives are used. At the time of sampling the daily output was 250 tons, all run-of-mine.

FULLER. BLACK PRINCE MINE

Analyses 75736 to 75738 (p. 97). A mine at Fuller on the P. R. R. Brookville coal. Roof, sandstone; floor, fireclay. Cover at point of sampling, 70 feet. Sampled at two points by E. G. Hill on August 21, 1920.

Sections of coal bed in Black Prince mine

Section	A		B	
Laboratory No.	75736		75737	
	Ft.	in.	Ft.	in.
Coal		11	1	6
Bone*		3		4
Coal	2	1	2	8
Cannel coal				9
Thickness of bed	3	3	5	3
Thickness of sample	3	0	4	11

*Not included in sample.

At the time of sampling the daily output was 15 tons.

HILLMAN. ARTHUR MINE

Analyses 75815 to 75817 (p. 97). A mine 2 miles east of Hillman, on the P. R. R. Upper Freeport coal. Thickness of bed, coal, and two samples, 31 inches. Cover at point of sampling, 40 to 60 feet. Roof, slate; floor, fireclay. Sampled at two points by E. G. Hill on August 25, 1920.

At the time of sampling the daily output was 100 tons.

KNOXDALE. NO. 1 SWAN MINE

Analyses 82682 to 82684 (p. 97). A drift mine (formerly Stewart No. 3) 100 feet above and one mile north of railroad station at Knoxdale, on P. & S. R. R. Lower Freeport coal; local dips. Roof, sandstone; floor, fireclay. Sampled at two points by L. D. Woodworth on November 7, 1921.

Sections of coal bed in No. 1 Swan mine

Section	A		B	
Laboratory No.	82682		82683	
	Ft.	in.	Ft.	in.
Coal	4	5	4	8
Clay*		1½		1½
Coal		5		4
Thickness of bed	4	11½	5	1½
Thickness of sample	4	10	5	0

*Not included in sample.

Coal is undercut by hand, and shot down with black powder and permissible explosives. At the time of sampling the daily output was 80 tons, 10 per cent from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 2 years. Mine was partly flooded when sampled.

LANES MILLS. RATTLESNAKE MINE

Analyses 82586 to 82589 (p. 97). A drift mine at Lanes Mills, on the P. R. R.; level with railroad. Lower Kittanning coal. Slight dip to north. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on November 2, 1921.

Sections of coal bed in Rattlesnake mine

Section	A		B		C	
Laboratory No.	82586		82587		82588	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		3				
Coal		7	1	0	1	0
Bony coal*		½		½		½
Coal	2	1	2	0	2	0
Thickness of bed	2	11½	3	½	3	½
Thickness of sample	2	8	3	0	3	0

*Not included in sample.

Coal is undercut by hand, and black blasting powder used. At the time of sampling the daily output was 200 tons, all run-of-mine from advance workings. Coal was picked on car. In 1920 the output was 20,000 tons. In 1921 the life of mine was estimated to be 15 years.

McGAREYS STATION. CHEROKEE MINE

Analyses 34904 to 34906 (p. 98). A mine of the Cherokee Mining Co. at McGareys Station, on the P. & S. R. R. Middle Kittanning coal. Roof, slate; floor, sandy slate. Cover at point of sampling, 150 feet. Sampled at two points by E. G. Hill on July 14, 1920.

Sections of coal bed in Cherokee mine

Section	A		B	
Laboratory No.	34904		34905	
	Ft.	in.	Ft.	in.
Coal	1	2	1	4
Bone*	*	2		½
Coal	2	½	2	½
Bone*		4		4
Thickness of bed	3	8½	3	9
Thickness of sample	3	2½	3	5

*Not included in sample.

At the time of sampling the daily output was 150 tons.

PAN COAST. PAN COAST MINE

Analyses 75728, 75729 and 75730 (p. 98). A mine at Pan Coast, on the P. R. R. Upper Kittanning coal. Roof, shale; floor, fireclay. Cover at point of sampling, 30 feet. Sampled at two points by E. G. Hill on August 21, 1920.

Sections of coal bed in Pan Coast mine

Section	A		B	
Laboratory No.	75728		75729	
	Ft.	in.	Ft.	in.
Coal	3	1	1	1
Bone*				2½
Coal			1	10
Thickness of bed	3	1	3	1½
Thickness of sample	3	1	2	11

*Not included in sample.

At the time of sampling the daily output was 225 tons.

PUNXSUTAWNEY. WILLIAMS RUN NO. 1 MINE

Analyses 75753 to 75756 (p. 98). A mine of the Williams Run Coal Co., 1 mile south of Punxsutawney on the P. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 60 to 80 feet. Sampled at three points by E. G. Hill on August 23, 1920.

Sections of coal bed in Williams Run No. 1 mine

Section	A		B		C	
Laboratory No.	75753		75754		75755	
	Ft.	in.	Ft.	in.	Ft.	in
Coal	4	3	4	4	4	5
Bone*						4
Dirty coal*						5
Thickness of bed	4	3	4	4	5	4
Thickness of sample	4	3	4	4	4	10

*Not included in sample.

The daily output at the time of sampling was 450 tons.

RAMSAYTOWN. NO. 4 SHAWMUT MINE

Analyses 34986 to 34988 (p. 99). Shawmut Mining Co. mine, 2 miles west of Ramsaytown, on P. & S. R. R. Lower Freeport coal. Roof, slate; floor, fireclay. Cover at point of sampling, 150 to 160 feet. Sampled at two points by E. G. Hill on July 15, 1920.

Sections of coal bed in No. 4 Shawmut mine

Section	A		B	
Laboratory No.	34986		34987	
	Ft.	in.	Ft.	in.
Coal		11	1	6
Bone		½		½
Coal	1	7	3	1
Bone		½	---	---
Coal	2	5	---	---
Thickness of bed	5	0	4	7½
Thickness of sample	5	0	4	7½

At the time of sampling the daily output was 800 tons.

STANTON STATION. HUNTER & GALBRAITH MINE

Analyses 34907 to 34909 (p. 99). A mine 1¾ miles from Stanton station, on the P. & S. R. R. Upper Freeport coal. Roof, slate; floor. fireclay. Cover at point of sampling, 150 feet. Samples taken by E. G. Hill on July 14, 1920, represent whole bed at two points where is measures 4 feet 11 inches and 5 feet of clean coal.

At time of sampling the daily output was 30 tons.

SUMMERVILLE. PENNSY NO. 6 MINE

Analyses 82804 to 82807 (p. 99). A drift mine 1275 feet above sea level, ¼ mile south of Summerville, on the P. R. R. Lower Kittanning coal. Local dips. Roof, slate; floor, rough clay. Sampled at three points on November 11, 1921, by L. D. Woodworth.

Sections of coal bed in Pennsy No. 6 mine

Section	A		B		C	
Laboratory No.	82804		82805		82806	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	---	---		2		2
Coal		7½		7		5
Bony coal*		½		½		½
Coal	1	7¾	1	9½	1	7½
Clay		¼		¼		¼
Coal		1½		1½		1½
Thickness of bed	2	5½	2	8¾	2	4¾
Thickness of sample	2	5	2	6¼	2	2¼

*Not included in sample.

Coal is undercut by machine and black powder is used. At the time of sampling the daily output was 350 tons, 75 per cent from advance workings. All coal is run-of-mine, and coal is picked on car. In 1921 the life of mine was estimated to be 10 years.

SUMMERVILLE. PENNSY NO. 10 MINE

Analyses 82808 to 82811 (p. 99). A drift mine 1185 feet above sea level, ¼ mile south of Summerville, on the P. R. R. Brookville coal. Local dips. Roof, gray rock; floor, hard rock. Sampled at three points on November 10, 1921, by L. D. Woodworth.

Sections of coal bed in Pennsy No. 10 mine

Section	A		B		C	
Laboratory No.	82808		82809		82810	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		3		11		9
Sulphur		¼	-----	-----	-----	-----
Bony coal*	-----	-----		6		6
Coal		1	1	5	1	4
Sulphur		¼		¼		¼
Coal		6		11	1	3
Bony coal*		6	-----	-----	-----	-----
Coal	1	5	-----	-----	-----	-----
Sulphur		¼	-----	-----	-----	-----
Coal		7	-----	-----	-----	-----
Sulphur		¼	-----	-----	-----	-----
Coal		2	-----	-----	-----	-----
Sulphur*		½	-----	-----	-----	-----
Coal		2	-----	-----	-----	-----
Thickness of bed	3	9½	3	9¼	3	10¼
Thickness of sample	3	3	3	3¾	3	4¼

*Not included in sample.

Coal is undercut by machine, and black powder is used. At the time of sampling the daily output was 500 tons, all run-of-mine from advance workings. Coal is picked on car. In 1921 the life of mine was estimated to be 10 years.

TIMBLIN. MILL NO. 2 MINE

Analyses 81568 to 81571 (p. 100). A drift mine 1600 feet above sea level, ½ mile southeast of Timblin, on the P. & S. R. R. Upper Freeport coal. Slight dip to northeast. Roof, sandstone; floor, hard fireclay. Sampled at three points by L. D. Woodworth on September 17, 1921.

Sections of coal bed in Mill No. 2 mine

Section	A		B		C	
Laboratory No.	81568		81569		81570	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	1	0		6		9
Coal		8		5	3	7
Mother coal		½		¼	-----	-----
Slate*	-----	-----	-----	-----		2
Coal	1	4		2	*	2
Sulphur*		½	-----	-----	-----	-----
Mother coal	-----	-----		¼	-----	-----
Coal		8	3	1	-----	-----
Sulphur		¼	-----	-----	-----	-----
Slate*	-----	-----		1	-----	-----
Coal	1	0	*	3	-----	-----
Slate*		2	-----	-----	-----	-----
Thickness of bed	4	11¼	4	6½	4	8
Thickness of sample	3	8¾	3	8½	3	7

*Not included in sample.

Coal is undercut by machine, and black powder is used. At the time of sampling the daily output was 300 tons, 80 per cent from advance workings. All coal is run-of-mine, and is picked on car. In 1921 the life of mine was estimated to be 4 years.

VALIER. LIGHT NO. 1 MINE

Analyses 81501 to 81504 (p. 100). A slope mine 1200 feet above sea level, at Valier on the B. R. & P. R. R. Lower Freeport coal. Slight dip; strike, north. Roof, slate; floor, fireclay. Cover at point of sampling, 60 feet. Sampled at three points by L. D. Woodworth on September 13, 1921.

Sections of coal bed in Light No. 1 mine

Section	A		B		C	
Laboratory No.	81501		81502		81503	
	Ft.	in.	Ft.	in.	Ft.	in
Coal*		2		2		2
Bony coal and bone*		3		4		2
Coal		9		11		10
Cannel coal		5		4		4
Coal	3	8½	3	7½	2	5
Bony coal*		½		½	-----	-----
Mother coal	-----	-----	-----	-----		½
Coal	-----	-----	-----	-----		2
Sulphur	-----	-----	-----	-----		¼
Coal	-----	-----	-----	-----	1	1
Thickness of bed	5	4	5	5	5	2¾
Thickness of sample	4	10½	4	10½	4	10¾

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. Mine but recently opened, and expected to produce 1,000 tons per day. All coal is run-of-mine, from advance workings, and is picked on car. In 1921 the life of mine was estimated to be 20 years.

WISHAW. TROUT RUN NO. 3 MINE

Analyses 82653 to 82655 (p. 100). A drift mine 1546.7 feet above sea level, at Wishaw, on the R. & F. C. R. R. Lower Freeport coal. Local dips. Roof, sandstone; floor, fireclay. Cover at point of sampling, 250 feet. Sampled at three points by L. D. Woodworth on November 5, 1921.

Sections of coal bed in Trout Run No. 3 mine

Section	A		B		C	
Laboratory No.	82653		82654		82655	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	4½	3	10	2	1
Bony coal*		1	-----	-----		½
Slate	-----	-----		½	-----	-----
Coal		11	-----	-----	1	0
Slate*		1	-----	-----		2
Coal*		1½		1½		1½
Thickness of bed	2	7	4	0	3	5
Thickness of sample	2	3½	3	10	3	1

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 400 tons; 50 per cent run-of-mine. Coal is screened and picked on belt. In 1921 the life of mine was estimated to be 10 years. Trout Run No. 1, 2, and 3 mines have a total daily output of 1,000 tons. The output in 1920 was 360,095 tons.

LAWRENCE COUNTY

WAMPUM. CRESCENT MINE

Analyses 34739 to 34742 (p. 101). A mine 2 miles west of Wampum on the P. R. R. Middle Kittanning coal. Roof, slate; floor, fireclay. Cover at point of sampling, 80 feet. Sampled at three points by E. G. Hill on June 18, 1920.

Sections of coal bed in Crescent mine

Section	A		B		C	
Laboratory No.	34739		34740		34741	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	3¼	2	7	2	5½
Sulphur*		¾	----	----		½
Coal, sulphur and bone ("clod")	----	----		6	----	----
Coal		6	----	----		5
Coal, impure ("clod")		3	----	----		3
Thickness of bed	3	1	3	1	3	2
Thickness of sample	3	0	3	1	3	1½

*Not included in sample.

At the time of sampling the daily output was 300 tons.

WAMPUM. VANCE MINE

Analyses 34736 to 34738 (p. 101). A country bank 2 miles south of Wampum, on the P. R. R. Upper Freeport coal. Roof, shale, then sandstone; floor, fireclay. Cover at point of sampling, 30 feet. Sampled at two points by E. G. Hill on June 21, 1921.

Sections of coal bed in Vance mine

Section	A		B	
Laboratory No.	34736		34737	
	Ft.	in.	Ft.	in.
Coal	5	10½	5	2
Bone*		½		½
Coal		4		8
Thickness of bed	6	3	5	10½
Thickness of sample	5	10½	5	2

*Not included in sample.

LYCOMING COUNTY

RALSTON. RED RUN MINE

Anaylses 75520 to 75522 (p. 101). A mine 2 miles west of Ralston on the P. R. R. Lower Kittanning coal. Roof, sandstone; floor, shale. Cover at point of sampling, 25 to 60 feet. Sampled at two points by E. G. Hill on August 6, 1920.

Sections of coal bed in Red Run mine

Section	A		B	
Laboratory No.	75520		75521	
	Ft.	in.	Ft.	in
Coal	2	4	1	0
Bone*				4
Coal			1	0
Thickness of bed	2	4	2	4
Thickness of sample	2	4	2	0

*Not included in sample.

At the time of sampling the daily output was 50 tons.

McKEAN COUNTY

CLERMONT. CLERMONT MINE

Analyses 34982 to 34985 (p. 101). A mine at Clermont on the P. S. & N. and P. R. R. Roof, sandstone; floor, clay. Cover at point of sampling, 60 to 70 feet. Sampled at three points by E. G. Hill on July 21, 1920.

Sections of coal bed in Clermont mine

Section	A		B		C	
Laboratory No.	34982		34983		34984	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	6	1	3	1	11
Bone*				7		
Coal				3		
Thickness of bed	2	6	2	1	1	11
Thickness of sample	2	6	1	6	1	11

*Not included in sample.

At time of sampling the daily output was 2 tons.

CLERMONT. COAL BLOSSOM MINE

Analyses 34992 to 34994 (p. 101). A mine ¼ mile south of Clermont on the P. S. & N. and P. R. R. Roof and floor, shale. Sampled at two points on the outcrop by E. G. Hill on July 20, 1920. The section was the same at both places.

Section of coal bed in Coal Blossom mine

Laboratory Nos.	34992 and 34993	
	Ft.	in.
Coal		8
Bone*		1
Coal	1	9
Thickness of bed	2	6
Thickness of sample	2	5

*Not included in sample.

MERCER COUNTY

DRAKE. NO. 5 SHARON MINE

Analyses 34807 to 34809 (p. 102). A mine of Sharon Coal and Limestone Co. at Drake on the P. R. R. Brookville coal. Roof, shale; floor, fireclay. Cover at point of sampling, 160 feet. Sampled at two points by E. G. Hill on June 24, 1920.

Sections of coal bed in No. 5 Sharon mine

Section	A		B	
Laboratory No.	34807		34808	
	Ft.	in.	Ft.	in.
Coal*		$5\frac{1}{2}$		$8\frac{1}{2}$
Bone*		$\frac{1}{2}$		$\frac{1}{2}$
Coal		$3\frac{1}{2}$	3	$4\frac{1}{2}$
Bone*		1	----	----
Coal	3	1	----	----
Thickness of bed	3	$11\frac{1}{2}$	4	$1\frac{1}{2}$
Thickness of sample	3	$4\frac{1}{2}$	3	$4\frac{1}{2}$

*Not included in sample.

At the time of sampling the daily output was 400 tons.

GROVE CITY. DIAMOND NO. 3 MINE

Analyses 34816 to 34818 (p. 102). A mine 2 miles east of Grove City on the P. & L. E. R. R. Brookville coal. Roof, sandstone; floor, fireclay. Cover at point of sampling, 65 feet. Sampled at two points by E. G. Hill on June 29, 1920.

Sections of coal bed in Diamond No. 3 mine

Section	A		B	
Laboratary No.	34816		34817	
	Ft.	in.	Ft.	in.
Coal	1	4	1	4
Bone*		2		2
Coal	2	7	2	11
Thickness of bed	4	1	4	5
Thickness of sample	3	11	4	3

*Not included in sample.

At the time of sampling the daily output was 200 tons.

Analysis 80590 (p. 102). The Diamond No. 3 mine was sampled by Chas. R. Fettke of the Carnegie Institute of Technology, Pittsburgh, Pa., on July 21, 1921.

Section of coal bed in Diamond No. 3 mine

Laboratory No.	80590	
	Ft.	in.
Coal	1	$4\frac{1}{2}$
Bone*		1
Coal	1	$1\frac{1}{2}$
Sulphur band*		1
Coal		2
Sulphur lens*		$\frac{1}{2}$
Coal	1	5
Thickness of bed	4	$3\frac{1}{2}$
Thickness of sample	4	1

*Not included in sample.

Coal is undercut by hand. At the time of sampling the daily output was 285 tons.

OAKES STATION. PENNSY MINE

Analyses 34804 to 34806 (p. 102). A mine at Oakes Station, 1 mile from Leesburg, on the P. R. R. Brookville coal. Roof, 8 inches of draw-slate, above is shale; floor, fireclay. Cover at point of sampling, 80 feet. Sampled at two points by E. G. Hill on June 22, 1920.

Sections of coal bed in Pennsy mine

Section	A		B	
Laboratory No.	34804		34805	
	Ft.	in.	Ft.	in.
Coal		8		9
Bone		¾	*	1½
Coal	2	9¾	2	8
Thickness of bed	3	6½	3	6½
Thickness of sample	3	6½	3	5

*Not included in sample.

At the time of sampling the daily output was 200 tons.

PARDOE. PARDOE MINE

Analyses 34813 to 34816 (p. 102). A mine 1 mile south of Pardoe, on the B. & L. E. R. R. Brookville coal. Roof and floor, slate. Cover at point of sampling, 40 feet. Sampled at two points by E. G. Hill on Juue 26, 1920.

Sections of coal bed in Pardoe mine

Section	A		B	
Laboratory No.	34813		34814	
	Ft.	in.	Ft.	in
Top coal				6
Coal	1	8	1	2
Sulphur*		1		½
Bone				½
Coal	1	6	1	5½
Bone*		2		1½
Coal	1	5	1	6
Thickness of bed	4	10	4	10½
Thickness of sample	4	7	4	2

*Not included in sample.

At the time of sampling the daily output was 80 tons.

STONEBORO. NO. 7 MERCER MINE

Analyses 34810 to 34812 (p. 103). A mine of Mercer Coal and Iron Co., on the P. R. R. and N. Y. C. R. R. Brookville coal. Roof, slate; floor, fireclay. Cover at point of sampling, 120 feet. Sampled at two points by E. G. Hill on June 25, 1920.

Sections of coal bed in No. 7 Mercer mine

Section	A		B	
Laboratory No.	34810		34811	
	Ft.	in.	Ft.	in.
Coal	2	2	1	5
Bone		½		½
Coal	1	5	1	4
Bone*		1½		2
Coal	1	10	1	5
Bone*				2½
Thickness of bed	5	7	4	7
Thickness of sample	5	5½	4	2½

*Not included in sample.

At the time of sampling the daily output was 700 tons.

SOMERSET COUNTY

BERLIN. SEIBERT & BRANDT MINE

Analysis 86838 (p. 104). A drift mine 1½ miles southwest of Berlin, on the B. & O. R. R. Sewickley (Pine Hill No. 1) coal. Roof, good shale and sandstone; floor, smooth fireclay. Cover at point of sampling, 50 feet. Sampled by J. D. Sisler on August 19, 1922.

Section of coal bed in Seibert & Brandt mine

Laboratory No.	86838	
	Ft.	in.
Coal	1	8
Bone*		2
Coal	2	0
Shale*		1
Coal		4
Thickness of bed	4	3
Thickness of sample	4	0

*Not included in sample.

Coal is undercut by hand. At the time of sampling the daily output was 50 tons, 90 per cent from advance workings. All coal is run-of-mine. The output in 1921 was 1,000 tons. In 1922 the life of mine was estimated to be 10 years.

CASSELMAN. MARINE SMOKELESS MINE

Analyses 81232 to 81235 (p. 105). Marine Smokeless Coal Co's. drift mine 1900 feet above sea level, at Casselman, on the Western Maryland R. R. Upper Kittanning coal. Level. Roof, fireclay; floor, hard slate. Sampled at three points on August 25, 1921 by L. D. Woodworth.

Sections of coal bed in Marine Smokeless mine

Section Laboratory No.	A 81232		B 81233		C 81234	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		11	1	9½	----	----
Sulphur		⅛	----	----	----	----
Coal		9	----	----	----	----
Bony coal		¼		¼	----	----
Coal	1	3	1	3	3	2
Bone		1½		2		1½
Coal (high sulphur)		9⅜		11¼		9½
Thickness of bed	3	10	4	2	4	1
Thickness of sample	2	11⅜	3	¾	3	2

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 160 tons, 80 per cent from advance workings; 90 per cent of coal is run-of-mine. Coal is picked on car. In 1921 the life of mine was estimated to be 15 years. The output in 1920 was 55,000 tons.

ELK LICK. CHAPMAN NO. 3 MINE

Analyses 80785 to 80787 (p. 105). Boynton Coal Co's. drift mine 2170 feet above sea level, at Elk Lick, on the B. & O. R. R. Pittsburgh coal. Level. Roof, bone; floor, hard slate. Sampled at two points on August 2, 1921 by L. D. Woodworth.

Sections of coal bed in Chapman No. 3 mine

Section	A		B	
Laboratory No.	80785		80786	
	Ft.	in.	Ft.	in.
Coal	2	11	2	6
Slate*		2		1¼
Coal	1	0	1	8
Slate*		½		1
Coal		11	1	1½
Slate		¼	----	----
Mother coal	----	----		1
Coal	1	9	1	11
Slate		¼	----	----
Coal		7½	----	----
Thickness of bed	7	5½	7	5¾
Thickness of sample	7	3	7	3½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 150 tons, all run-of-mine. Coal is picked on car. In 1921 the life of mine was estimated to be 1 year.

GARRETT. GARRETT SLOPE MINE

Analyses 80885 to 80887 (p. 106). A slope mine 1960 feet above sea level, 1½ miles north of Garrett, on the B. & O. R. R. Upper Kittanning coal. Dip, 10 degrees; strike, northeast. Roof, sandstone; floor, bone. Sampled at three points on August 9, 1921 by L. D. Woodworth.

Sections of coal bed in Garrett Slope mine

Section	A		B		C	
Laboratory No.	80885		80886		80887	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	1	1	6		9
Slate		¼		¼	----	----
Sulphur and slate*	----	----	----	----		1
Coal	1	4½		2		8
Slate		¼	*	2	*	1½
Sulphur		¼	----	----	----	----
Coal	----	----		11		2½
Sulphur	----	----	*	½	----	----
Slate*	----	----	----	----		½
Coal	1	4¾	1	3¼	1	11½
Thickness of bed	3	11	4	1	3	11
Thickness of sample	3	11	3	10½	3	8

*Not included in sample.

Coal is undercut by machine, and dynamite is used. At the time of sampling the daily output of the mine was 400 tons, all run-of-mine from advance workings. Coal is picked on car. The output in 1920 was 76,542 tons. In 1921 the life of mine was estimated to be 40 years.

GARRETT. McALLEN MINE

Analyses 80882 to 80884 (p. 106). A drift mine 1960 feet above sea level, 1½ miles north of Garrett, on B. & O. R. R. Lower Freeport coal. Roof, slate; floor, hard slate. Sampled at two points on August 10, 1921 by L. D. Woodworth.

Sections of coal bed in McAllen mine

Section	A		B	
Laboratory No.	80882		80883	
	Ft.	in.	Ft.	in.
Coal		8	1	1
Bone*		1		
Mother coal				⅛
Coal		11		5
Bone*		1		
Bony coal				¼
Coal		5		9⅛
Bony coal*		6		
Thickness of bed	2	8	2	3½
Thickness of sample	2	0	2	3½

*Not included in sample.

The mine is operated on the butt-entry system. Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 100 tons, and run-of-mine from advance workings. In 1921 the life of mine was estimated to be 15 years.

GARRETT. NO. 2 ATLANTIC MINE

Analyses 80995 to 80998 (p. 106). A drift mine 2360 feet above sea level, 5 miles northwest of Garrett, on the B. & O. R. R. Brookville coal. Level. Roof, sandstone; floor, fireclay, bony coal (varies). Cover at point of sampling, 18 to 50 feet. Sampled at three points on August 17, 1921 by L. D. Woodworth.

Sections of coal bed in No. 2 Atlantic mine

Section	A		B		C	
Laboratory No.	80995		80996		80997	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		6		11		8
Bone*		1		1		
Mother coal						¼
Coal		5	1	6¾		5
Bone	*	½		¼		
Mother coal						¼
Coal	1	8		3		
Bony coal*						9
Coal						2
Bony coal*						9½
Thickness of bed	2	8½	2	10	2	10
Thickness of sample	2	7	2	9	1	3½

*Not included in sample.

Coal is undercut by hand; black blasting powder is used. At the time of sampling, the daily output was 350 tons, all run-of-mine from advance workings. In 1921 the life of mine was estimated to be 20 years.

LISTONBURG. MILLER MINE

Analyses 81348 to 81351 (p. 108). A drift mine 1720 feet above sea level, at Listonburg, on the White Creek Branch of the B. & O. R. R. Upper Kittanning coal. Slight dip to west. Roof, white shale; floor, hard bony. Sampled at three points by L. D. Woodworth on August 30, 1921.

Sections of coal bed in Miller mine

Section	A		B		C	
Laboratory No.	81348		81349		81350	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		6		4		4
Bone*		1½		1½		1
Coal		9	2	5		5
Sulphur streaks		⅛	--	--		1/16
Coal	1	10⅜	--	--		8
Sulphur streaks	--	--	--	--		1/16
Coal	--	--	--	--	1	2⅞
Thickness of bed	3	3	2	10½	2	9
Thickness of sample	3	1½	2	9	2	8

*Not included in sample.

Coal is undercut by machine, and shot down with Monobel and other permissible explosives. All coal is run-of-mine and is picked on car. At the time of sampling the daily output of the mine was 210 tons, 90 per cent from advance workings.

MARKLETON. SNYDER MINE

Analyses 81229 to 81231 (p. 109). M. A. Snyder Coal Co's. drift mine ¼ mile east of Markleton, on the W. M. R. R. Lower Kittanning coal; level. Roof, slate; floor, hard fireclay. Sampled at two points by L. D. Woodworth on August 26, 1921.

Sections of coal bed in Snyder mine

Section	A		B	
Laboratory No.	81229		81230	
	Ft.	in.	Ft.	in.
Coal		7		4
Mother coal	--	--		¼
Bone*		2		1½
Coal		5		6
Mother coal and clay		¼		¼
Coal		11¾	1	1
Thickness of bed	2	2	2	1
Thickness of sample	2	0	1	11½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. Coal is 95 per cent run-of-mine, and is picked on car. At the time of sampling the daily output was 50 tons, all from advance workings. The output in 1920 was 7,000 tons. In 1921 the life of mine was estimated to be 15 years.

MEYERSDALE. STOTLER MINE

Analysis 86832 (p. 109). A drift mine at Meyersdale, on the W. M. R. R. Little Pittsburgh coal. Roof, sandstone (fractured); floor, fireclay (soft, smooth). Cover at point of sampling, 100 feet. Sampled on August 27, 1922 by J. D. Sisler.

Section of coal bed in Stotler mine

Laboratory No.	86832	
	Ft.	in.
Bony coal*		8
Coal	2	10
Bone*		2
Thickness of bed	3	8
Thickness of sample	2	10

*Not included in sample.

Coal is undercut by hand and picked on car. At the time of sampling the daily output was 50 tons, all run-of-mine from advance workings. In 1922 the life of mine was estimated to be 20 years.

MEYERSDALE. STOTLER MINE

Analyses 80999 to 81001 (p. 109). E. Stotler & Son Co's. drift mine 2200 feet above sea level, ¼ mile northwest of Meyersdale, on the B. & O. R. R. Pittsburgh coal (lower bench). Level. Roof and floor, slate. Sampled at two points by L. D. Woodworth.

Sections of coal bed in Stotler mine

Section Laboratory No.	A 80999		B 81000	
	Ft.	in.	Ft.	in.
Coal		7½		7½
Bone*		½		½
Coal	1	3½		1
Bony coal*		1	----	----
Sulphur	----	----		⅛
Slate*		2	----	----
Coal		2		11
Bony coal*	----	----		2½
Bone*		½	----	----
Slate*	----	----		2
Coal		8½		2
Slate	----	----		¼
Coal	----	----		4
Sulphur	----	----		¼
Coal	----	----		5
Thickness of bed	3	1½	3	0
Thickness of sample	2	9½	2	7

*Not included in sample.

Coal is undercut by hand; and shot down with black powder. At the time of sampling the daily output was 250 tons, all run-of-mine from advance workings. Coal is picked on car. In 1921 the life of mine was estimated to be 4 years.

MEYERSDALE. STOTLER MINE

Analyses 81006 to 81008 (p. 109). E. Stotler & Son Co's. drift mine 2260 feet above sea level, ¼ mile northwest of Meyersdale, on the B. & O. R. R. Redstone coal. Level. Roof, slate; floor, hard slate. Sampled at two points on August 16, 1921 by L. D. Woodworth.

Sections of coal bed in Stotler mine

Section	A		B	
Laboratory No.	81006		81007	
	Ft.	in.	Ft.	in.
Coal	1	2	1	4
Bone*		2		1
Coal	1	8		3
Bone*	---	---		½
Coal	---	---		3
Bone	---	---		¼
Coal	---	---	1	4¼
Thickness of bed	3	0	3	4
Thickness of sample	2	10	3	2½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 200 tons, all run-of-mine from advance workings. Coal is picked on car. In 1921 the life of mine was estimated to be 3 years.

MEYERSDALE. ENGLE MINE

Analysis 86837 (p. 110). A drift mine 2290 feet above sea level, 1½ miles southeast of Meyersdale. Upper Freeport coal. Dip, 10 per cent; strike, S. 30° E. Thickness of bed, coal, and sample, 32 inches. Roof, fair shale; floor, hard fireclay. Cover at point of sampling, 150 feet. Sampled at one point on August 20, 1922 by J. D. Sisler.

Coal is undercut by hand, all run-of-mine from advance workings. At the time of sampling the daily output was 20 tons. Output in 1921 was 500 tons. In 1922 the life of mine was estimated to be 20 years.

MEYERSDALE. NO. 104 CONSOLIDATION MINE

Analyses 80852 to 80854 (p. 110). A drift mine 2170 feet above sea level, 2½ miles southwest of Meyersdale, on the B. & O. R. R. Pittsburgh coal. Slight dip. Roof, sandstone; floor, hard, bony coal. Sampled at two points by L. D. Woodworth on August 8, 1921.

Sections of coal bed in No. 104 Consolidation mine

Section	A		B	
Laboratory No.	80852		80853	
	Ft.	in.	Ft.	in.
Coal		4		5
Bony coal*	1	3	---	---
Bone	---	---		¼
Coal		8		3
Bone*		1	---	---
Bony coal*	---	---	1	8
Coal	2	0	1	1½
Bone*		2		½
Coal	1	4	2	4¾
Thickness of bed	5	10	5	11
Thickness of sample	4	4	4	2½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output. all pillar coal, was 100 tons, all being run-of-mine. Coal is picked on car. In 1921 the life of mine was estimated to be one year.

MEYERSDALE. No. 105 CONSOLIDATION MINE

Analyses 80855 to 80859 (p. 110). A drift mine 2170 feet above sea level, 2½ miles southwest of Meyersdale, on the B. & O. R. R. Redstone coal. Slight dip; strike, northeast. Roof, sandstone; floor, soft fireclay. Sampled at four points by L. D. Woodworth on August 1, 1921.

Sections of coal bed in No. 105 Consolidation mine.

Section	A		B		C		D	
Laboratory No.	80855		80856		80857		80858	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal		5½	2	0	2	0	1	10
Slate		¼	*	1	-----	-----	*	1
Bony coal	-----	-----	-----	-----	*	2	-----	-----
Coal	1	4	2	5½		8	1	5½
Bone*		2½	-----	-----	-----	-----	-----	-----
Slate	-----	-----	-----	-----	*	½		¼
Coal	2	3	-----	-----		6		1
Slate	*	½	-----	-----	*	½		¼
Coal		1¾	-----	-----	1	2½		11½
Thickness of bed	4	5½	4	6½	4	7½	4	5½
Thickness of sample	4	2½	4	5½	4	4½	4	4½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 400 tons, all run-of-mine from advance workings. Coal is picked on car. In 1921 the life of mine was estimated to be 5 years.

MEYERSDALE. BLACK MINE

Analyses 81075 to 81077 (p. 111). A drift mine of Black Coal Co. 3 miles northwest of Meyersdale, on W. M. R. R. Upper Freeport coal. Dip, 10 degrees; strike, northwest. Roof, slate; floor, hard fireclay. Sampled at two points on August 19, 1921 by L. D. Woodworth.

Sections of coal bed in Black mine

Section	A		B	
Laboratory No.	81075		81076	
	Ft.	in.	Ft.	in.
Coal		10		9
Slate		⅛		¼
Coal	1	5⅞		10
Bony coal*	-----	-----		½
Coal	-----	-----		11¼
Thickness of bed	2	4	2	7
Thickness of sample	2	4	2	6½

*Not included in sample.

Coal is undercut by hand and shot down with black powder. At the time of sampling the daily output was 100 tons, all run-of-mine, and from advance workings. Coal is picked on car. In 1921 the life of mine was estimated to be 15 years.

MEYERSDALE. PIKE WAGON MINE

Analysis 86833 (p. 111). A drift mine 2220 feet above sea level, 3 miles south of Meyersdale. Upper Freeport coal. Dip, 14 degrees; strike, S. 4° E. Roof, soft shale; floor, hard, smooth fireclay. Cover at point of sampling, 75 feet. Sampled at one point on August 26, 1922 by J. D. Sisler.

Section of coal bed in Pike mine

Laboratory No.	86833	
	Ft.	in.
Coal	3	0
Bone*		1½
Coal		6
Thickness of bed	3	7½
Thickness of sample	3	6

*Not included in sample.

Coal is undercut by hand, and is picked on car. At the time of sampling the daily output was 20 tons, all run-of-mine from advance workings. Output in 1921 was 500 tons. In 1922 the life of mine was estimated to be 25 years.

MEYERSDALE. NO. 3 MEYERSDALE MINE

Analyses 81002 to 81004 (p. 111). Meyersdale Fuel Co's. drift mine 6 miles south of Meyersdale, on B. & O. R. R. Redstone coal. Level. Roof, clay and coal; floor, hard rock. Sampled at two points on August 15, 1921 by L. D. Woodworth.

Sections of coal bed in No. 3 Meyersdale mine

Section	A		B	
Laboratory No.	81002		81003	
	Ft.	in.	Ft.	in.
Coal		2	1	1½
Sulphur		¼	---	---
Bone	---	---		¼
Coal	1	1½		2
Bony coal*		1	---	---
Sulphur	---	---		¼
Coal	2	7¼	2	4½
Thickness of bed	4	0	3	8½
Thickness of sample	3	11	3	8½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 200 tons, 75 per cent from advance workings. All coal is run-of-mine and is picked on cars. The life of mine in 1921 was estimated to be eight years.

MEYERSDALE. NO. 3 MEYERSDALE MINE

Analysis 81005 (p. 111). Meyersdale Fuel Co's. drift mine 6 miles south of Meyersdale, on the B. & O. R. R. Pittsburgh coal. Level. Roof, bone and slate; floor, hard slate. Sampled at this point on August 15, 1921 by L. D. Woodworth.

Section of coal bed in No. 3 Meyersdale mine

Laboratory No.	81005	
	Ft.	in.
Coal	2	1
Bone*		1
Coal		1½
Bone		⅛
Coal	1	1½
Bone		⅛
Coal	2	2¼
Thickness of bed	5	7½
Thickness of sample	5	6½

*Not included in sample.

Coal is undercut by hand; black blasting powder is used. At the time of sampling the daily output was 50 tons, 20 per cent from advance workings. All coal is run-of-mine, and is picked on car. In 1921 the life of mine was estimated to be 8 years.

ROCKWOOD. NO. 10 QUEMAHONING MINE

Analyses 81150 to 81153 (p. 112). A drift mine 2020 feet above sea level, ½ mile west of Rockwood, on the W. M. R. R. Upper Freeport coal. Level. Roof, slate; floor, hard slate. Cover at point of sampling, 100 feet. Sampled at three points on August 22, 1921, by L. D. Woodworth.

Sections of coal bed in No. 10 Quemahoning mine

Section	A		B		C	
Laboratory No.	81150		81151		81152	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	5		6		2
Sulphur		¼		½		
Slate						¼
Coal		10	1	8	1	7
Bone*		2		1		1½
Coal		10¾		7½		4
Bony coal						¼
Coal						1
Thickness of bed	3	4	2	11	2	4
Thickness of sample	3	2	2	9½	2	2½

*Not included in sample.

Coal is undercut by machine; Monobel permissible explosive is used. At time of sampling the daily output was 200 tons, 50 per cent from advance workings; 95 per cent of coal is run-of-mine. In 1921 the life of mine was estimated to be 25 years.

ROCKWOOD. NO. 1 MacGREGOR MINE

Analyses 81154 to 81156 (p. 112). A drift mine 1950 feet above sea level, 4 miles north of Rockwood on the B. & O. R. R. Lower Kittanning coal. Level. Roof, sandstone; floor, hard fireclay. Sampled at two points on August 23, 1921 by L. D. Woodworth.

Sections of coal bed in No. 1 MacGregor mine

Section	A		B	
Laboratory No.	81154		81155	
	Ft.	in.	Ft.	in.
Coal		4		8
Bone		¼		½
Coal		4	1	3
Bone*		½		½
Coal		8½		10
Slate & sulphur		¼	----	----
Coal		6	----	----
Bone*		½	----	----
Coal		8	----	----
Thickness of bed	2	8	2	10
Thickness of sample	2	7	2	9

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. Coal is run-of-mine, and is picked on car. At the time of sampling the daily output was 100 tons, 75 per cent from advance workings. The output in 1920 was 70,000 tons. In 1921 the life of mine was estimated to be 30 years.

ROCKWOOD. MURDOCK MINE

Analyses 81160 to 81162 (p. 113). A drift mine 2000 feet above sea level, 6 miles north of Rockwood, on the B. & O. R. R. Lower Kittanning coal. Level. Roof, sandstone; floor, hard slate. Sampled at two points on August 24, 1921 by L. D. Woodworth.

Sections of coal bed in Murdock mine

Section	A		B	
Laboratory No.	81160		81161	
	Ft.	in.	Ft.	in.
Coal		4½		11
Sulphur		¼	----	----
Slate	----	----		¼
Coal		4	1	3
Slate		½		¼
Coal		5		8
Sulphur*		½	----	----
Coal		6	----	----
Slate		¼	----	----
Coal		10	----	----
Thickness of bed	2	7	2	10¼
Thickness of sample	2	6	2	10½

*Not included in sample.

The coal is undercut by hand; black blasting powder and Monobel explosive are used. At the time of sampling the daily output was 100 tons, all run-of-mine from advance workings. In 1921 the life of mine was estimated to be 15 years.

SALISBURY. COMPTON MINE

Analyses 86827 to 86830 (p. 113). A drift mine 2180 feet above sea level, 2 miles northwest of Salisbury, on the B. & O. R. R. Barton coal. Dip, 5 degrees; strike, S. 25° W. Roof, soft shale; floor, smooth fireclay. Cover at point of sampling, 50 to 150 feet. Sampled at three points on August 25, 1922 by J. D. Sisler. The bed where samples Nos. 86827, 86828, and 86829 were cut measured respectively 2 feet 9 inches, 2 feet 6 inches, and 2 feet 8 inches of clean coal.

Coal is undercut by hand. At the time of sampling the daily output was 20 tons, all run-of-mine from advance workings. In 1922 the life of mine was estimated to be 50 years. The output in 1921 was 1,000 tons.

SALISBURY. DAVIS MINE

Analysis 86834 (p. 113). A drift prospect 2300 feet above sea level, 3 miles northwest of Salisbury. Lower Kittanning coal. Dip, 14 degrees; strike, S. 30° W. Roof, good sandstone; floor, hard, smooth fireclay. Cover at point of sampling, 50 feet. Sampled by J. D. Sisler on August 25, 1922.

Section of coal bed in Davis mine

Laboratory No.	86834	
	Ft.	in.
Coal, soft, bony*	2	0
Coal, hard	1	2
Bone*		½
Coal		4
Bone*		1
Coal		2
Bone*		½
Coal		8
Thickness of bed	4	7
Thickness of sample	2	5

*Not included in sample.

This mine is operated on the longwall system, and coal is undercut by hand.

SALISBURY. OPAL MINE

Analysis 86835 (p. 113). A drift prospect 2680 feet above sea level, 3 miles northwest of Salisbury. Lower Bakerstown coal. Roof, good shale; floor, soft, tough fireclay. Cover at point of sampling, 75 feet. Sampled at one point by J. D. Sisler on August 24, 1922.

Section of coal bed in Opal mine

Laboratory No.	86835	
	Ft.	in.
Bony coal*		8
Coal	1	2
Shale*		2
Coal	1	4
Thickness of bed	3	4
Thickness of sample	2	6

*Not included in sample.

Coal is undercut by hand. The output in 1921 was 50 tons. All coal is run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 50 years.

STONY CREEK. COUNTRY BANK

Analysis 87002 (p. 113). A prospect opened by drift, 2 miles northeast of Stony Creek. Thickness of bed, coal, and sample, 34 inches. Roof, sandstone; floor, shale. Sampled at one point by J. D. Sisler in September, 1922.

SUMMIT MILLS. JOHNSON MINE

Analysis 86836 (p. 114). A drift mine 2560 feet above sea level, 2 miles northwest of Summit Mills. Upper Freeport coal. Dip, 12 degrees; strike, S. 40° W. Roof, good sandstone; floor, soft, smooth fireclay. Cover at point of sampling, 150 feet. Sampled by J. D. Sisler on August 20, 1922.

Section of coal bed in Johnson mine

Laboratory No.	86836	
	Ft.	in.
Coal	2	4
Bone		2
Coal*		8
Thickness of bed	3	2
Thickness of sample	2	6

*Not included in sample.

Coal is undercut by hand. All coal is run-of-mine, from advance workings. Output in 1921 was 500 tons. At the time of sampling the daily output was 5 tons. In 1922 the life of mine was estimated to be 30 years.

SUMMIT MILLS. HANDIVERK MINE

Analysis 86831 (p. 114). A drift prospect 2300 feet above sea level, 3 miles northwest of Summit Mills. Lower Freeport coal. Dip, 5 degrees; strike, S. 20° W. Roof, good sandstone; floor, soft, tough fireclay. Cover at point of sampling, 50 feet. Sampled at one point by J. D. Sisler on August 28, 1922.

Section from Handiverk mine

Laboratory No.	86831	
	Ft.	in.
Draw slate*	2	0
Coal	2	4
Bone*		1
Coal		2
Thickness of bed	4	7
Thickness of sample	2	6

*Not included in sample.

Coal is undercut by hand, and is all run-of-mine from advance workings. At the time of sampling the daily output was 10 tons. In 1922 the life of mine was estimated to be 20 years.

URSINA. MILL MINE

Analyses 82582 to 82585 (p. 114). A drift mine at Ursina on the Ursina and North Branch R. R. Upper Kittanning coal. Roof, shale; floor, fireclay. Cover at point of sampling, 200 to 300 feet plus. Sampled at three points by E. G. Hill on October 29, 1921.

Sections of coal bed in Mill mine

Section	A		B		C	
Laboratory No.	82582		82583		82584	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	11	1	10	1	10
Binder*		3		2½		4
Coal		5		6		4
Clay parting*	2	4	1	7	1	10
Coal		9		9		9
Bone*		2				
Thickness of bed	5	10	4	10½	5	1
Thickness of sample	3	1	3	1	2	11

*Not included in sample.

Coal is undercut by hand, is all run-of-mine, and shot down with black powder. At the time of sampling the daily output was 50 tons. In 1921 the life of mine was estimated to be 10 years.

URSINA. MILL MINE

Analysis 81352 (p. 114). A drift mine 1350 feet above sea level, ¼ mile east of Ursina, on a branch of the B. & O. R. R. Upper Freeport coal. Level. Roof, slate; floor, hard slate. The bed was sampled at one point on August 31, 1921 by L. D. Woodworth.

Section of coal bed in Mill mine

Laboratory No.	81352	
	Ft.	in.
Coal	2	4
Bone*		2
Coal		5
Thickness of bed	2	11
Thickness of sample	2	9

*Not included in sample.

Coal is undercut by hand, shot down with black powder, and is picked on cars. At the time of sampling the daily output was 80 tons, all run-of-mine from advance workings. In 1921 the life of mine was estimated to be 10 years.

TIOGA COUNTY

ANTRIM. MEREDITH MINE

Analyses 82052 to 82055 (p. 118). A wagon drift mine 1610 feet above sea level, 1 mile south of Antrim. Cushing coal. Roof, slate; floor, sandstone. Cover at point of sampling 30 feet. Sampled at three points on October 12, 1921 by L. D. Woodworth.

Sections of coal bed in Meredith mine

Section	A		B		C	
Laboratory No.	82052		82053		82054	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	1	6	1	4	1	0
Slate*		4				
Sulphur				¼		
Coal		9		5		
Slate*				4		
Thickness of bed	2	7	2	1¼	1	0
Thickness of sample	2	3	1	9¼	1	0

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. At the time of sampling the daily output was 50 tons, all run-of-mine and from advance workings; it is picked on car. In 1921 the life of mine was estimated to be 25 years. This mine was opened in June 1921.

ARNOT. NO. 1 BLOSSBURG MINE

Analyses 82251 to 82254 (p. 118). A drift mine 1617 feet above sea level, at Arnot, on the Erie R. R. Bloss (?) coal. Slight dip to northeast. Roof, slate; floor, hard fireclay. Sampled at three points on October 19, 1921 by L. D. Woodworth.

Sections of coal bed in No. 1 Blossburg mine

Section	A		B		C	
Laboratory No.	82251		82252		82253	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		8		7		11
Slate*		8				
Bony coal*				3		4
Coal		7				
Slate*			1	2	1	3
Bony coal*		2				
Coal		4		8		10
Bony coal*				1		
Slate						11
Coal				3	1	6
Bony coal*				½		
Coal				3		
Slate*				4		
Coal				6		
Slate*				5		
Thickness of bed	2	5	4	6½	5	9
Thickness of sample	1	7	2	3	3	3

*Not included in sample.

Coal is shot off the solid, black blasting powder being used, and is picked on cars. At the time of sampling the daily output was 180 tons, 75 per cent being from advance workings. All coal is run-of-mine. In 1921 the life of mine was estimated to be 10 years.

MORRIS RUN. NO. 12 MORRIS RUN MINE

Analyses 82228 to 82231 (p. 118). A drift mine 1700 feet above sea level, at Morris Run, Pa., on the N. Y. C. and Erie railroads. Bloss coal. Slight dip to southwest. Roof, slate; floor, fireclay. Cover at point of sampling, 100 feet. Sampled at three points on October 17, 1921 by L. D. Woodworth.

Sections of coal bed in No. 12 Morris Run mine

Section	A		B		C	
Laboratory No.	82228		82229		82230	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		1		1		1
Coal	2	5	2	6	2	6
Thickness of bed	2	6	2	7	2	7
Thickness of sample	2	5	2	6	2	6

*Not included in sample.

Coal is undercut by hand and machine; black powder and dynamite are used. At the time of sampling the daily output was 250 tons, all being run-of-mine, and 75 per cent from advance workings. Coal is screened with 2½ to 4-inch screens, and is picked on tables. In 1921 the life of mine was estimated to be 10 years.

MORRIS RUN. NO. 13 MORRIS RUN MINE

Analyses 82232 to 82234, and 82240 (p. 119). A drift mine at Morris Run, on the N. Y. C. and Erie railroads. Seymour coal. Local dips. Roof, slate; floor, hard fireclay. Sampled at three points on October 15, 1921 by L. D. Woodworth.

Sections of coal bed in No. 13 Morris Run mine

Section	A		B		C	
Laboratory No.	82232		82233		82234	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal		6	2	0	1	8
Sulphur		$\frac{1}{4}$	*	1	*	$\frac{1}{2}$
Coal		7		10		4
Sulphur		$\frac{1}{4}$				
Bony coal*						5
Coal	1	5				
Thickness of bed	2	$6\frac{1}{2}$	2	11	2	$5\frac{1}{2}$
Thickness of sample	2	$6\frac{1}{2}$	2	10	2	0

*Not included in sample.

Coal is undercut by hand, and is run-of-mine, picked on tables. Screens are used ($2\frac{1}{2}$ to 4 inch). At the time of sampling the daily output was 250 tons, all from advance workings. The output in 1920 was 50,000 tons. The life of mine in 1921 was estimated to be 15 years.

MORRIS RUN. NO. 16 MORRIS RUN MINE

Analyses 82224 to 82227 (p. 119). A drift mine 1726 feet above sea level, at Morris Run, on the N. Y. C. and Erie railroads. Morgan coal. Slight dip to southwest. Roof, sandstone; floor, fireclay. Sampled at three points by L. D. Woodworth on October 17, 1921.

Sections of coal bed in No. 16 Morris Run mine

Section	A		B		C	
Laboratory No.	82224		82225		82226	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		9		9		8
Coal	2	3	3	2	2	10
Bone*		2				
Fireclay*					1	1
Coal*						7
Slate*						4
Coal*						9
Thickness of bed	3	2	3	11	6	3
Thickness of sample	2	3	3	2	2	10

*Not included in sample.

Coal is undercut by hand; black powder and dynamite are used. From $2\frac{1}{2}$ to 4-inch screens are used, and coal is picked on tables. At the time of sampling the daily output was 300 tons, all being run-of-mine from advance workings. In 1921 the life of mine was estimated to be 10 years.

WASHINGTON COUNTY

ARDEN. ARDEN NO. 2 MINE

Analysis 80529 (p. 119). Meadow Lands Coal Co's. shaft mine 180 feet deep, 1 mile northwest of Arden on the P. R. R. Pittsburgh coal. Nearly horizontal. Roof, sandy shale; floor, hard shale. Cover at point of sampling, 250 to 300 feet. Sampled at one point by C. R. Fettke on July 14, 1921.

Section of coal bed in Arden No. 2 mine

Laboratory No.	80529	
	Ft.	in.
Roof coal*		2
Draw-slate (shale)*		4
Coal	2	10½
Black shale*		½
Coal*		1¾
Black shale*		½
Coal	2	3¼
Coal high in sulphur*		4½
Thickness of bed	6	3
Thickness of sample	5	1¾

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. Bar screens are used. At the time of sampling the daily output was 1,400 tons. In 1921 the life of mine was estimated to be 5 years.

BESCO. CHAMPION MINE

Analyses 83850 to 83853 (p. 120). A drift mine above railroad station at Besco on the P. R. R. Pittsburgh coal. Roof, slate; floor, fireclay. Sampled at three points by L. D. Woodworth on January 18, 1922.

Sections of coal bed in Champion mine

Section	A		B		C	
Laboratory No.	83850		83851		83852	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	4	0	3	4½	3	0
Slate*		¼		½		½
Coal		2		3		3
Slate*		½		½		½
Coal	2	4	2	5½	2	11
Thickness of bed	6	6¾	6	2	6	3
Thickness of sample	6	6	6	1	6	2

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. Screens (¾ inch) are used, and coal is picked on cars. At the time of sampling the daily output was 300 tons, all being run-of-mine. In 1922 the life of mine was estimated to be 5 years.

BESCO. HUPP COUNTRY BANK

Analysis 84427 (p. 120). A drift mine 175 feet above and ½ mile north of station at Besco. This coal is used by owner for domestic purposes only. Waynesburg coal. Roof, sandstone; floor, soft clay. Sampled at one point by L. D. Woodworth on February 24, 1922.

Section of coal bed in Hupp mine

Laboratory No.	84427	
	Ft.	in.
Coal		6
Shale*		2
Coal	1	3
Clay*	1	1
Bony coal*		2
Coal	1	6
Coal and shale*		8
Thickness of bed	5	4
Thickness of sample	3	3

*Not included in sample.

Coal is undercut by hand.

DENBO. BAKER MINE

Analysis 84010 (p. 120). A drift mine 1 mile north of Denbo. Thickness of bed, coal, and sample, 18 inches. Roof, hard clay; floor, clay. Sampled by L. D. Woodworth on February 1, 1922 at 20 feet from crop. Coal is undercut by hand. All coal is run-of-mine from advance workings.

DENBO. ROPP MINE

Analysis 84009 (p. 120). A drift mine 1½ miles north of Denbo. Waynesburg coal. Roof and floor, hard clay. Sampled on February 1, 1922, by L. D. Woodworth.

Section of coal bed in Ropp mine

Laboratory No.	84009	
	Ft.	in.
Coal	1	4
Clay*		4
Coal		6
Clay*		1
Coal		7
Thickness of bed	2	10
Thickness of sample	2	5

*Not included in sample.

Coal is undercut by hand.

MILLSBORO. AGNES MINE

Analyses 83966 to 83969 (p. 121). A drift mine 20 feet below Millsboro station at Millsboro on the P. R. R. Pittsburgh coal. Roof, sandstone; floor, hard clay. Sampled at three points by L. D. Woodworth on January 26, 1922.

Sections of coal bed in Agnes mine

Section	A		B		C	
Laboratory No.	83966		83967		83968	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	3	10	3	10½	3	9
Slate*		½		½		½
Coal	2	8		2		2
Slate*	----------			½		½
Coal	----------		2	0	2	0
Bottom coal*	----------			5		5
Thickness of bed	6	6½	6	6½	6	5
Thickness of sample	6	6	6	½	5	11

*Not included in sample.

Coal is undercut by machine, and shot down with black powder. At the time of sampling the daily output was 200 tons, all run-of-mine. In 1922 the life of mine was estimated to be 1½ years.

WEST BROWNSVILLE. LILLEY MINE

Analyses 84019 to 84025 (p. 122). A slope mine 92 feet deep, level with station, ½ mile north of West Brownsville, on the P. R. R. Pittsburgh coal. Roof, slate; floor, hard clay. Sampled at six points by L. D. Woodworth on February 2, 1922.

Sections of coal bed in Lilley mine

Section	A		B		C		D		E		F	
Laboratory No.	84019		84020		84021		84022		84023		84024	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Coal	4	10	4	9½	5	0	5	4½	5	6½	5	5
Slate	*	½	*	½		⅛		⅛	*	½	*	½
Coal	2	6½		2		2	2	1	2	2½		3
Slate	----------		*	½		⅛	----------		----------		*	½
Coal	----------		1	9½	2	2	----------		----------		1	5
Floor coal*	----------			9	----------		----------		----------			10
Thickness of bed	7	5	7	7	7	4¼	7	5⅝	7	9½	8	0
Thickness of sample	7	4½	6	9	7	4¼	7	5⅝	7	9	7	1

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 2,000 tons, 90 per cent from advance workings. All coal is run-of-mine. From ¾ to 1¼ inch screens are used. In 1922 the life of mine was estimated to be 15 years.

WEST BROWNSVILLE. VESTA NO. 7 MINE

Analyses 83961 to 83965 (p. 122). A shaft mine 99 feet deep, above station 1 mile southwest of West Brownsville, on the P. R. R. Pittsburgh coal. Roof, slate; floor, hard clay. Sampled at four points by L. D. Woodworth on January 25, 1922.

Sections of coal bed in Vesta No. 7 mine

Section	A		B		C		D	
Laboratory No.	83961		83962		83963		83964	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Roof coal*		9	1	0	1	0		10
Coal	4	3	4	7	4	6	4	10
Slate		1/8		1/4	*	1/2	*	1/2
Coal		6	2	5		3		2
Slate		1/8	-----	-----	*	1/2	*	1/2
Coal	1	7	-----	-----	2	0	2	0
Bottom coal*		6	-----	-----		5		5
Thickness of bed	7	7 1/4	8	1/4	8	3	8	4
Thickness of sample	6	4 1/4	7	1/4	6	9	7	0

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 1,200 tons, all being run-of-mine. In 1922 the life of mine was estimated to be 2 years.

WESTMORELAND COUNTY

ADAMSBURG. ADAMSBURG MINE

Analyses 84158 to 84160 (p. 123). A drift mine 1120 feet above sea level, ¼ mile west of Adamsburg on the B. & O. R. R. Redstone coal. Dip, slightly northwest. Roof, slate; floor, shale. Cover at point of sampling, 200 feet. The bed was sampled at two points by E. G. Hill, on February 8, 1922. Thickness of bed and sample 84,158, 4 feet 11 inches; and of sample 84,159, 4 feet 2 inches of clean coal.

Coal is undercut by machine; permissible explosives are used. At the time of sampling, the mine had just been opened. In 1922 the life of mine was estimated to be 5 years.

ALVERTON. FOX COUNTRY BANK

Analysis 85353 (p. 123). A drift mine 1195 feet above sea level, 1 mile north of Alverton, on the P. R. R. Sewickley coal. Dip, southeast; strike, northeast. Thickness of coal and sample, 2 feet, not including 2 inches of bony coal on top. Roof and floor, shale. Cover at point of sampling, 30 feet. The bed was sampled at one point by L. D. Woodworth on April 7, 1922.

Coal is undercut by hand. All coal is run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 10 years.

APOLLO. PAULTON MINE

Analyses 85664 to 85667 (p. 123). A drift mine ½ mile west of Apollo, on the P. R. R. Upper Freeport coal. Dip, northwest; strike, northeast. Roof and floor, shale. Sampled at three points by L. D. Woodworth on May 6, 1922.

Sections of coal bed in Paulton mine

Section	A		B		C	
Laboratory No.	85664		85665		85666	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	2	0		2	3	2
Bony coal*		1/2		1/2		1/2
Coal	1	0	3	1		4
Bony coal*		1		1/2	-----	-----
Coal		6		4	-----	-----
Bony streaked coal*		3		4		8
Coal		5	-----	-----	-----	-----
Thickness of bed	4	3 1/2	4	0	4	2 1/2
Thickness of sample	3	11	3	7	3	6

*Not included in sample.

Coal is undercut by machine; permissible explosives are used. At the time of sampling the daily output was 75 tons, all run-of-mine from advanced workings. Coal is picked on cars. In 1922 the life of mine was estimated to be 50 years.

BLAIRSVILLE. NO. 1 PACKSADDLE MINE

Analyses 85403 to 85405 (p. 123). A drift mine ¼ mile east of Blairsville, on the P. R. R. Upper Freeport coal. Dip, northwest; strike, northeast. Roof, shale; floor, fireclay. Sampled at two points by L. D. Woodworth on April 20, 1922.

Sections of coal bed in No. 1 Packsaddle mine

Section	A		B	
Laboratory No.	85403		85404	
	Ft.	in.	Ft.	in.
Coal and sulphur*		2		2
Coal	2	6	2	6
Shale*		1½		2
Coal		7		6½
Thickness of bed	3	4½	3	4½
Thickness of sample	3	1	3	½

*Not included in sample.

Coal is undercut by hand, and shot down with black powder. Coal is run-of-mine and is picked on cars. At the time of sampling the daily output was 40 tons, all from advance workings. Output in 1921 was 4,000 tons. In 1922 the life of mine was estimated to be 15 years.

BOLIVAR. McFEELY BRICK "B" MINE

Analyses 85576 to 85578 (p. 123). A slope mine same elevation as Bolivar station, ½ mile east of Bolivar on the main line of the P. R. R. Lower Kittanning coal. Dip, southeast; strike, northeast and southwest. Thickness, 3 feet 5 inches to 3 feet 5½ inches. Roof, shale; floor, fireclay. The bed was sampled at two points on April 29, 1922 by L. D. Woodworth.

Sections of coal bed in McFeely Brick "B" mine

Section	A		B	
Laboratory No.	85576		85577	
	Ft.	in.	Ft.	in.
Bony coal*		6		6
Coal	2	11	1	0
Sulphur*	---	---		½
Coal	---	---	1	11
Thickness of bed	3	5	3	5½
Thickness of sample	2	11	2	11

*Not included in sample.

The coal is undercut by hand; black powder, dynamite, and permissible explosives are used. At the time of sampling the daily output was 25 tons, all run-of-mine from advance workings. In 1922 the life of mine was estimated to be 40 years. The coal is mostly consumed by brickworks.

BOLIVAR. McFEELY BRICK "E" MINE

Analyses 85579 to 85581 (p. 123). A drift mine 192 feet above and ½ mile east of Bolivar on main line of P. R. R. Upper Freeport coal. Roof, shale; floor, fireclay. Sampled at two points by L. D. Woodworth on April 29, 1922.

Sections of coal bed in McFeely Brick "E" mine

Section	A		B	
Laboratory No.	85579		85580	
	Ft.	in.	Ft.	in.
Coal and sulphur*		2		2
Coal	1	6	1	6
Bony streaked coal*		7		10
Coal		11	3	3
Mother coal		½	----	----
Bony coal*	----	----		6
Coal	1	1		5
Mother coal		½	----	----
Coal	1	5	----	----
Bony coal*		2	----	----
Coal		6	----	----
Thickness of bed	6	4½	6	8
Thickness of sample	5	5½	5	2

*Not included in sample.

Coal is undercut by hand; black powder and permissible explosives are used. At the time of sampling the daily output was 25 tons, all run-of-mine. In 1922 the life of mine was estimated to be 15 years. The coal is mostly consumed by brickworks.

DARLINGTON. SHIREY MINE

Analyses 85347 to 85349 (p. 123). A drift mine 30 feet above water level at Darlington, on the Ligonier Valley R. R. Coal bed, Lower Freeport. Dip, southeast; strike, northeast. Roof, shale; floor, fireclay. Sampled at two points by L. D. Woodworth on April 14, 1922.

Sections of coal bed in Shirey mine

Section	A		B	
Laboratory No.	85347		85348	
	Ft.	in.	Ft.	in.
Bony streaked coal*	1	3	1	1
Coal		4		4
Shale*		½	----	----
Coal and shale*	----	----		3
Coal		1	2	2
Coal and shale*		2	----	----
Coal	2	4	----	----
Thickness of bed	4	2½	3	10
Thickness of sample	2	9	2	6

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 40 tons, all being run-of-mine from advance workings. In 1922 the life of mine was estimated to be 10 years.

DARLINGTON. SEGAR MINE

Analyses 85350 to 85352 (p. 124). A drift mine 25 feet above water level, 1 mile north of Darlington on the Ligonier Valley R. R. Upper Freeport coal. Dip, southeast; strike, northeast. Roof, sandstone; floor, fireclay. Sampled at two points on April 14, 1922 by L. D. Woodworth.

Sections of coal bed in Segar mine

Section	A		B	
Laboratory No.	85350		85351	
	Ft.	in.	Ft.	in.
Coal		6		6
Shale*		5		5
Coal	2	0		7
Bony coal*		4	----	----
Sulphur*	----	----		½
Coal and shale*		9	----	----
Coal		11	1	2
Bony coal*	----	----		5
Coal and shale*	----	----		9
Coal	----	----	1	2
Thickness of bed	4	11	5	½
Thickness of sample	3	5	3	5

*Not included in sample.

Coal is undercut by hand. Mine was idle at time of sampling.

DERRY. DECCO MINE

Analyses 85344 to 85346 (p. 124). A shaft mine 142 feet deep, 30 feet above and ¼ mile west of station at Derry, on the P. R. R. Upper Freeport coal. Dip, 17 degrees northwest; strike, northeast. Roof, sandstone; floor, clay. Sampled at two points by L. D. Woodworth on April 13, 1922.

Sections of coal bed in Decco mine

Section	A		B	
Laboratory No.	85344		85345	
	Ft.	in.	Ft.	in.
Coal and shale*		4		3
Coal	2	2	2	5
Bony streaked coal*	1	0	1	7
Coal		5	----	----
Sulphur*		½		½
Coal		10	1	4
Bony coal*		1		½
Coal		5		5
Thickness of bed	5	3½	6	1
Thickness of sample	3	10	4	2

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. All coal is run-of-mine, and is picked on cars. At the time of sampling the daily output was 50 tons, all from advance workings. In 1922 the life of mine was estimated to be 8 years.

DONOHOE. SREANKO CUSTOM BANK

Analyses 85335 to 85337 (p. 124). A drift mine 3 miles northeast of Donohoe. Upper Freeport coal. Dip, northwest; strike, northeast. Roof, sandstone; floor, shale. Sampled at two points by L. D. Woodworth on April 6, 1922.

Sections of coal bed in Sreanko mine

	A		B	
Section	A		B	
Laboratory No.	85335		85336	
	Ft.	in.	Ft.	in.
Coal	1	9	1	8
Shale*		1		1
Coal		4		4
Shale*		½		1
Coal		9		8
Shale*		3		1
Coal		1		3
Thickness of bed	3	3½	3	2
Thickness of sample	2	11	2	11

*Not included in sample.

Coal is undercut by hand; black powder is used. All coal is run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 15 years.

EDNA. MEYERS MINE

Analysis 84738 (p. 124). A drift mine 1175 feet above sea level, ½ mile west of Edna. Sewickley coal. Dip, northwest; strike, northeast. Roof, clay and shale; floor, clay. Sampled by L. D. Woodworth on March 15, 1922.

Section of coal bed in Meyers mine

Laboratory No.	84738	
	Ft.	in.
Coal		5½
Clay*		4
Coal		5½
Clay*		2½
Coal	1	1
Thickness of bed	2	6½
Thickness of sample	2	0

*Not included in sample.

Coal is undercut by hand. All coal is run-of-mine, from advance workings. In 1922 the life of mine was estimated to be 10 years.

EISAMAN. DELVITTO MINE

Analyses 84735 to 84737 (p. 124). A drift mine 1025 feet above sea level, ½ mile east of Eisaman station, on the P. R. R. Conemaugh Division. Mahoning coal. Dip, southeast; strike, northeast. Roof, shale; floor, hard shale. Sampled at two points by L. D. Woodworth on March 15, 1922.

Sections of coal bed in Delvitto mine

Section	A		B	
Laboratory No.	84735		84736	
	Ft.	in.	Ft.	in.
Coal	1	3½	2	0
Shale		¼		1*
Coal		11		8
Slate*		½	----	----
Bony coal*	----	----		3
Coal		7	----	----
Thickness of bed	2	10¼	3	0
Thickness of sample	2	9¾	2	8

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 25 tons, all being run-of-mine from advance workings. In 1922 the life of mine was estimated to be 10 years.

EISAMAN. COUNTRY BANK

Analysis 81073 (p. 124). A prospect opened 1040 feet above sea level, ¼ mile east of Eisaman. Mahoning coal. Roof, shale; floor, hard shale. Cover at point of sampling, 30 feet. Sampled by E. G. Hill on August 18, 1921.

Section of coal bed in country bank mine

Laboratory No.	81073	
	Ft.	in.
Coal	2	
Binder		½
Cannel coal		2
Coal		7
Thickness of bed	2	9½
Thickness of sample	2	9½

Coal is undercut by hand.

EXPORT. ELIZABETH MINE

Analyses 84758 to 84761 (p. 125). A drift mine of W. B. Skelly Coal Co., 1193.3 feet above sea level, at Export, on the P. R. R. Pittsburgh coal. Dip, southeast; strike northeast. Roof, shale; floor, fireclay. Sampled at three points by L. D. Woodworth on March 17, 1922.

Sections of coal bed in Elizabeth mine

Section	A		B		C	
Laboratory No.	84758		84759		84760	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*	----	----		1	----	----
Coal	4	4	3	9	4	1
Slate*		½		½		¾
Coal		3		4		4½
Slate*		½		½		½
Coal	1	10	2	0	1	10
Thickness of bed	6	6	6	3	6	4¼
Thickness of sample	6	5	6	1	6	3¼

*Not included in sample.

Coal is undercut by machine, and black powder is used. At the time of sampling the daily output was 450 tons, 40 per cent from advance workings. Bar screens (¾ inch) are used; and sizes produced are lump and slack. The output in 1921 was 83,000 tons. In 1922 the life of mine was estimated to be 8 years.

GREENSBURG. MILLER MINE

Analysis 81149 (p. 125). An entry 1140 feet above sea level, 4½ miles southwest of Greensburg. Bakerstown coal. Roof, gouge; floor, hard, smooth. Cover at point of sampling, 90 feet. Sampled by E. G. Hill on August 22, 1921.

Section of coal bed in Miller mine

Laboratory No.	81149	
	Ft.	in
Coal	5	0
Cannel coal	1	4
Bone and coal*	1	0
Thickness of bed	7	4
Thickness of sample	6	4

*Not included in sample.

Coal is undercut by hand. The output in 1920 was 480 tons.

HAYDENVILLE. HILLTOP MINE

Analyses 85341 to 85343 (p. 125). A slope mine 1 mile southwest of Haydenville, at the County Home Junction of the P. R. R. Redstone coal. Dip, northwest; strike, northeast. Roof and floor, shale. Sampled at two points by L. D. Woodworth on April 8, 1922.

Sections of coal bed in Hilltop mine

Section	A		B	
Laboratory No.	85341		85342	
	Ft.	in.	Ft.	in.
Bony coal*		7		6
Coal	2	9	2	7
Shale*		3		2
Coal	1	0	1	0
Bony coal*		½	----	----
Shale*	----	----		½
Coal		7		6
Thickness of bed	5	2½	4	9½
Thickness of sample	4	4	4	1

*Not included in sample.

Coal is undercut by hand; permissible explosives are used. All coal is picked on car and is run-of-mine. In 1922 the life of mine was estimated to be 10 years.

HERMINIE. FAIRHAVEN MINE

Analyses 84664 to 84666 (p. 125). A drift mine 1050 feet above sea level, ½ mile east of Herminie on the P. R. R. Waynesburg coal. Dip, west; strike, north. Roof, sandstone; floor, fireclay. Sampled at two points by L. D. Woodworth on March 14, 1922.

Sections of coal bed in Fairhaven mine

Section	A		B	
Laboratory No.	84664		84665	
	Ft.	in.	Ft.	in.
Coal		11		11
Clay*	1	0		10
Bony coal*		1		
Coal	2	7	2	1
Clay*		3½	----	----
Clay and coal*	----	----		4
Coal	1	6	1	7
Thickness of bed	6	4½	5	11
Thickness of sample	5	0	4	7

*Not included in sample.

The mine was idle at time of sampling.

HERMINIE. EDWARDS NO. 4 MINE

Analyses 81157 to 81159 (p. 125). A drift mine 1030 feet above sea level, 1 mile north of Herminie, on the Andrews Run Branch of the P. R. R. Waynesburg coal. Roof, sandstone; floor, hard shale. Cover at point of sampling, 100 feet. Sampled at two points by E. G. Hill August 23, 1921.

Sections of coal bed in Edwards No. 4 mine

Section	A		B	
Laboratory No.	81157		81158	
	Ft.	in.	Ft.	in.
Coal		10	1	0
Sandstone*		8	1	0
Coal	2	0	2	11
Bone binder*		2		1
Coal	2	6	1	4
Thickness of bed	6	2	6	4
Thickness of sample	5	4	5	3

*Not included in sample.

Coal is undercut by machine, and permissible explosives are used. At the time of sampling the daily output was 200 tons, all run-of-mine. Output in 1920 was 30,000 tons. In 1921 the life of mine was estimated to be 14 years.

HUFF. LAWSON PROSPECT

Analysis 81072 (p. 125). An opening 1100 feet above sea level, 1½ miles east of Huff. Bakerstown coal. Roof, shale; floor, hard shale. Cover at point of sampling, 8 feet. Sampled by E. G. Hill on August 18, 1921.

Section of coal bed in Lawson mine

Laboratory No.	81072	
Carbonaceous shale*		7
Coal		9
Shale binder		½
Coal		11
Thickness of bed	2	3½
Thickness of sample	1	8½

*Not included in sample.

This opening was made to show Bakerstown coal.

HUNKERS. WESTMORELAND BRICK COAL MINE

Analyses 85338 to 85340 (p. 125). A drift mine 980 feet above sea level, ½ mile southwest of Hunkers on the P. R. R. Upper Freeport coal. Dip, southeast; strike, northeast. Roof, sandstone; floor, shale. Sampled at two points by L. D. Woodworth on April 7, 1922.

Sections of coal bed in Westmorcland mine

Section	A		B	
Laboratory No.	85338		85339	
	Ft.	in.	Ft.	in.
Coal and sulphur*		6		2
Coal	2	0	2	4
Shale*		2		
Sulphur*				½
Coal		10	1	5
Sulphur*		½		
Shale*				½
Coal		7		5
Shale*		1		
Coal		3		
Thickness of bed	4	5½	4	5
Thickness of sample	3	8	4	2

*Not included in sample.

Coal is undercut by hand, and black powder is used. At the time of sampling the daily output was 25 tons, all run-of-mine from advance workings. In 1922 the life of mine was estimated to be 50 years.

JEANNETTE. SAUDELL COUNTRY BANK

Analysis 81074 (p. 126). A drift mine 1030 feet above sea level, 1 mile east of Jeannette. Upper Freeport coal. Roof, shale; floor, hard fireclay. Cover at point of sampling, 40 feet. Sampled by E. G. Hill on August 19, 1921.

Section of coal bed in Saudell mine

Laboratory No.	81074	
	Ft.	in.
Coal		3
Cannel coal		2½
Coal	2	8½
Thickness of bed	3	2
Thickness of sample	3	2

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 6 tons, all run-of-mine.

JEANNETTE. CHRISTMAN MINE

Analysis 81146 (p. 126). A drift mine 1140 feet above sea level, 2 miles east of Jeannette. Mahoning coal. Roof, sandstone; floor, hard, smooth. Cover at point of sampling, 25 feet. Sampled by E. G. Hill on August 20, 1921.

Section of coal bed in Christman mine

Laboratory No.	81146	
	Ft.	in.
Carbonaceous shale*		9
Coal	1	10
Carbonaceous shale*	1	0
Thickness of bed	3	7
Thickness of sample	1	10

*Not included in sample.

Coal is undercut by hand.

JEANNETTE. JACOBS PROSPECT

Analysis 81147 (p. 126). Entry just started, 1275 feet above sea level, 2 miles east of Jeannette. Harlem coal. Thickness of bed, coal, and sample, 17 inches. Roof, limestone; floor, hard, smooth. Cover at point of sampling, 5 feet. Sampled on August 20, 1921, by E. G. Hill, 5 feet in from mouth of entry. Coal is undercut by hand.

JEANNETTE. SMALL BROS. MINE

Analysis 81148 (p. 126). A drift mine 1190 feet above sea level, 2¼ miles east of Jeannette. Mahoning coal. Roof, good slate; floor, smooth slate. Cover at point of sampling, 45 feet. Sampled by E. G. Hill on August 20, 1921.

Section of coal bed in Small Bros. mine

Laboratory No.	81148	
	Ft.	in.
Coal	2	10
Clay parting*		1
Coal	1	1
Thickness of bed	4	0
Thickness of sample	3	11

*Not included in sample.

Coal is undercut by hand, and black powder is used.

KINGSTON. BARRETT MINE

Analyses 85406 to 85409 (p. 126). A slope mine 1100 feet above sea level, ¾ mile north of Kingston, on the Ligonier Valley R. R. Upper Freeport coal. Dip, northwest; strike, northeast. Roof, sandstone; floor, fireclay. Sampled at three points by L. D. Woodworth on April 18, 1922.

Sections of coal bed in Barrett mine

Section Laboratory No.	A 85406		B 85407		C 85408	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		1		1½		
Coal		5½		7		3½
Bony coal		*½		*½		¼
Coal	1	2	1	3	2	7
Coal and shale*				2		5
Shale		¼				
Coal		10	1	7		9
Shale		¼				
Coal and shale*				5		
Coal		10	2	3		
Coal and shale*		5				
Coal	1	1				
Thickness of bed	4	11½	6	5	4	¾
Thickness of sample	4	5	5	8	3	7¾

*Not included in sample.

Coal is undercut by hand, and Monobel No. 6, a permissible explosive, is used. At the time of sampling the daily output was 150 tons, 75 per cent being from advance workings. All coal is run-of-mine. In 1922 the life of mine was estimated to be 3 years.

LAUGHLINSTOWN. DARR MINE

Analysis 85354 (p. 126). A drift mine 70 feet above water level, at Laughlinstown, used for local custom only. Upper Freeport coal. Dip, northwest; strike, northeast. Roof and floor, shale. Sampled by L. D. Woodworth on April 11, 1922.

Section of coal bed in Darr mine

Laboratory No.	85354	
	Ft.	in.
Coal		4
Shale		¼
Coal	1	9
Coal and shale*		1
Coal		4
Coal and shale*		1
Coal		4
Thickness of bed	2	11¼
Thickness of sample	2	9¼

*Not included in sample.

Coal is undercut by hand, and black powder is used. At the time of sampling the daily output was 4 tons, all run-of-mine from advance workings. In 1922 the life of mine was estimated to be 20 years.

LAUGHLINSTOWN. HALL MINE

Analysis 85355 (p. 126). A drift mine 25 feet above water level, ½ mile north of Laughlinstown, used for custom coal only. Lower Kittanning coal. Dip, northwest; strike, northeast. Roof, shale; floor, fireclay. Sampled by L. D. Woodworth on April 11, 1922.

Section of coal bed in Hall mine

Laboratory No.	85355	
	Ft.	in.
Bony coal*		9
Coal*		1
Sulphur*		1
Coal	1	9
Shale*		1
Coal		9
Thickness of bed	3	6
Thickness of sample	2	6

*Not included in sample.

Coal is undercut by hand, and black powder is used. At the time of sampling the daily output was 8 tons, all being run-of-mine from advance workings. In 1922 the life of mine was estimated to be 15 years.

MT. PLEASANT. KING MINE

Analyses 85328 to 85329 (p. 127). A drift mine about 1120 feet above sea level, one mile southwest of Mt. Pleasant, on the P. R. R. Coal is not shipped. Redstone coal. Dip, southeast; strike, northeast. Roof and floor, shale. Sampled at two points by L. D. Woodworth on April 4, 1922.

Sections of coal bed in King mine

Section	A		B	
Laboratory No.	85328		85329	
	Ft.	in.	Ft.	in.
Bony coal*		3		—
Coal	1	0	1	0
Sulphur*		—		2
Bony coal*		2		—
Coal	3	2	3	4
Coal, shale and sulphur*		—		4
Thickness of bed	4	7	4	10
Thickness of sample	4	5	4	4

*Not included in sample.

Coal is undercut by hand, and permissible explosives are used. At the time of sampling the daily output was 60 tons, all being run-of-mine from advance workings. In 1922 the life of mine was estimated to be 25 years.

PARNASSUS. VALLEY CAMP NO. 3 MINE

Analyses 80035 and 80688 (p. 127). A mine in Upper Freeport coal. Almost horizontal. Roof, sandstone; floor, soft. Cover at point of sampling, 600 to 700 feet. Sampled on May 31, 1921, by Chas. R. Fettke.

Section of coal bed in Valley Camp No. 3 mine

Laboratory No.	80035	
	Ft.	in.
Cannel coal*		10
Coal*		4
Black shale*		9
Coal	2	0
Bone*		6
Coal	3	6
Shale*		½
Coal*		4
Shale*		1
Coal*		11
Thickness of bed	9	3½
Thickness of sample	5	6

*Not included in sample.

Sample 80688 represents only 10 inches of cannel coal at top of bed.

Coal is undercut by machine. At the time of sampling the daily output was 3,000 tons net.

SALINA. APOLLO NO. 1 MINE

Analyses 85680 to 85682 (p. 127). A drift mine about 1,000 feet above sea level, 1 mile northwest of Salina, on the P. R. R. Upper Freeport coal. Dip, southeast; strike, northeast. Roof, shale; floor, fireclay. Sampled at two points on May 8, 1922, by L. D. Woodworth.

Sections of coal bed in Apollo No. 1 mine

	A		B	
Section	A		B	
Laboratory No.	85680		85681	
	Ft.	in.	Ft.	in.
Bony coal*	1	0	1	0
Coal	3	3		5
Bony coal*		4		½
Coal		11	2	7
Bony coal*				1
Coal				3
Bony coal*				4
Coal			1	0
Thickness of bed	5	6	5	8½
Thickness of sample	4	2	4	3

*Not included in sample.

Coal is undercut by machine; black powder and permissible explosives are used. At the time of sampling the daily output was 50 tons, all being run-of-mine and 10 per cent of it from advance workings. In 1922 the life of mine was estimated to be 5 years.

SALINA. APOLLO NO. 2 MINE

Analyses 85676 to 85679 (p. 127). A drift mine about 850 feet above sea level 1 mile northwest of Salina, on the P. R. R. Lower Kittanning coal. Dip, southeast; strike, northeast. Roof, shale; floor, fireclay. Sampled at three points on May 8, 1922 by L. D. Woodworth.

Sections of coal bed in Apollo No. 2 mine

Section	A		B		C	
Laboratory No.	85676		85677		85678	
	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal*		10		7		10
Coal	1	2		11	1	0
Bony coal*		1		1		1
Coal	1	6	1	6	1	3
Coal and sulphur*		2				
Sulphur*				1½		1
Coal		9		3		2
Sulphur*				½		½
Coal				3		5
Thickness of bed	4	6	3	9	3	10½
Thickness of sample	3	5	2	11	2	10

*Not included in sample.

Coal is mined by machine; black powder and permissible explosives are used. At the time of sampling the daily output was 100 tons, all being run-of-mine from advance workings. Coal is picked on car. In 1922 the life of mine was estimated to be 25 years.

SLICKVILLE. FRANK RUGH MINE

Analyses 83660 and 83661 (p. 128). A drift mine ½ mile north of Slickville. Pittsburgh coal. Roof, coal; floor, clay. Cover at point of sampling, 50 feet. Sampled at two points by E. G. Hill on December 28, 1921.

Sections of coal bed in Frank Rugh mine

Section	A		B	
Laboratory No.	83660		83661	
	Ft.	in.	Ft.	in.
Bone*				4
Coal	4	6	4	8
Binder		½		
Coal		11		
Binder		¼		½
Coal	2	0	2	9
Thickness of bed	7	5¾	7	9½
Thickness of sample	7	5¾	7	5½

*Not included in sample.

Coal is undercut by hand, and black powder is used. All coal is run-of-mine.

SLICKVILLE. EDWARDS MINE

Analyses 83657 to 83659 (p. 128). A drift mine ¾ mile southwest of Slickville, on the P. R. R. Pittsburgh coal. Roof, coal; floor, clay. Cover at point of sampling, 60 feet. Sampled at two points by E. G. Hill on December 28, 1921.

Sections of coal bed in Edwards mine

Section	A		B	
Laboratory No.	83657		83658	
	Ft.	in.	Ft.	in.
Coal	4	8	4	2
Binder		½		¼
Coal		5		6
Binder	*	1		⅛
Coal	2	0		4
Binder*				¾
Coal			1	7
Thickness of bed	7	2½	6	8⅛
Thickness of sample	7	1½	6	7⅜

*Not included in sample.

Coal is undercut by hand, and black powder is used. At the time of sampling the daily output was 200 tons, all being run-of-mine. In 1921 the life of mine was estimated to be 6 months.

SMITHTON. LIBERTY MINE

Analyses 85322 to 85324 (p. 128). A drift mine 910 feet above sea leveel, ¾ mile northeast of Smithton, on the B. & O. R. R. Redstone coal. Dip, northwest; strike, northeast. Roof, shale; floor, fireclay. Sampled at two points by L. D. Woodworth on April 1, 1922.

Sections of coal bed in Liberty mine

Section	A		B	
Laboratory No.	85322		85323	
	Ft.	in.	Ft.	in.
Bony coal*		3		3
Coal		6½	3	7
Shale*		½		
Coal	1	9		
Shale		¼		
Coal		9		
Thickness of bed	3	4¼	3	10
Thickness of sample	3	¾	3	7

*Not included in sample.

Coal is undercut by hand, and black powder is used. At the time of sampling the daily output was 10 tons, all being run-of-mine from advance workings. In 1922 the life of mine was estimated to be 25 years.

SWEDE HILL. HILL TOP MINE

Analyses 81069 to 81071 (p. 128). A slope mine 1090 feet above sea level, ¼ mile south of Swede Hill, on the P. R. R. Redstone coal. Roof, shale; floor, smooth and soft fireclay. Cover at point of sampling, 100 feet. Sampled at two points by E. G. Hill on August 17, 1921.

Sections of coal bed in Hill Top mine

Section	A		B	
Laboratory No.	81069		81070	
	Ft.	in.	Ft.	in.
Sulphur band		½	---	---
Bone	---	---		3
Coal	3	0	2	10
Shale*		2		3½
Coal	1	0	1	5
Sulphur		¼	---	---
Coal		5	---	---
Thickness of bed	4	7¾	4	9½
Thickness of sample	4	5¾	4	6

*Not included in sample.

Coal is undercut by hand. At the time of sampling the daily output was 50 tons.

ANALYSES OF DELIVERED COAL

By

N. H. Snyder[12]

Coal analyses help to describe the character of coal as it lies in the ground or as it may be delivered to the user. Analyses of samples of coal collected from the face of the bed in mines are plentiful, but available analyses of delivered coal are relatively few, and there is a distinct difference between "mine samples" and "delivered samples."

Mine samples are collected according to a standard method.[13] The sampler cuts a channel 2 by 6 or 3 by 4 inches from roof to floor in the face of the bed, and excludes from the sample all partings more than ⅜ inch thick, and any lenses or concretions of sulphur or other impurities more than 2 inches in maximum diameter and ½ inch thick.

Analyses of mine samples form a permanent and scientific record of the coal bed at the point sampled; they are important in determining the character of the coal in any given mine or district. These analyses, when the samples are taken by a standard method, are valuable to the operator. When compared with analyses of delivered coal they show him whether his mine is being worked efficiently or whether the coal is being properly prepared, which involves the question whether he has suitable mechanical appliances for separating the impurities.

In the purchase of coal, mine samples may serve as a sufficient guide for the experienced buyer who has knowledge of the impurities in the bed, and the degree to which these are eliminated in mining and preparing the coal. To the average purchaser, however, unacquainted with these details, dependence on mine samples may be misleading. The quality of coal indicated by the base samples can rarely, if ever, be attained in the delivered coal. Certain impurities that are eliminated from the formally prepared mine sample may not be eliminated by the miner. Some of the roof and floor may also be included if these are soft or flaky. When coal prices are high and competition is lessened it is easy for the miner and the management to lower the standards of preparation, and a return to rigid standards is always difficult.

In sampling delivered coal the Bureau of Mines follows a definite procedure.[14] A sample of not less than 1000 pounds is systematically

[12]Engineer in charge, Fuel Inspection, Bureau of Mines.

[13]Holmes, J. A., The sampling of coal in the mine: Tech. Paper 1, Bureau of Mines, 1918, 17 pp.

[14]Pope, G. S., Methods of sampling delivered coal and specifications for the purchase of coal for the Government: Bull. 116, Bureau of Mines, 1918, 64 pp.

Pope, G. S., Directions for sampling coal for shipment or delivery: Tech. Paper 133, Bureau of Mines, 1917, 5 pp.

collected by taking an equal quantity at regular intervals throughout the delivery, while coal is being loaded or unloaded, and crushing and reducing this sample by successive stages to laboratory size.

In using analyses of samples of delivered coal, it must be recognized that coal is not all of uniform size, and that the impurities are not uniformly distributed. Hence there will be some variation in the results of sampling, and even though the same mass of coal is sampled a number of times, the analyses would not agree absolutely except by chance. It is only when a considerable number of analyses, representing a considerable tonnage mined over a period of time, are available that the average composition and range of variation of coal from a particular mine become known with certainty.

Delivered coal from any given mine may differ from day to day through variations in mining or preparing the coal, hence an analysis of coal delivered at any one date should not be considered a complete record, for the character of the output may be greatly improved by new methods of mining and preparation; or, on the other hand, it may deteriorate through carelessness.

The folded table gives the analyses of samples collected by representatives of the various Government departments, under direction of the Bureau of Mines, from coal delivered to the Government, and of samples collected by representatives of the Bureau of Mines from coal delivered to railroad cars at mine tipples. In the former case samples were collected systematically throughout the entire delivery, and in the latter case samples were collected systematically throughout an entire day's run at the mine. These records of delivered coal indicate more nearly what the consumer is likely to receive, but the amount of coal represented and the number of analyses made must be carefully considered.

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